Louisiana CONSERVATION REVIEW

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AUTUMN
1937

Oil Pumper, The Texas Co., Lake Barre Bield.

THE DOCTORS AGREE---

That one of the world's greatest petroleum reserves will be found in the Gulf Coast Geosyncline.

Dr. H. V. Howe, director of the geological division of the Department of Conservation, and Dr. R. J. Russell, on the faculty of Louisiana State University, have advanced the theory that the thick, petroliferous tertiary column of the Gulf Coast Geosyncline was originated under depositional conditions similar to those of today in Southern Louisiana; that the shifting position of the mouth of the Mississippi River in various geological times has naturally shifted the position of the delta depositions.

Improved exploration technique and deeper drilling in the coastal areas of Louisiana have given the geologists, geophysisists and paleontologists a more accurate knowledge of these delta depositions, which is now being applied to the study of formations farther northward, in central and northern Louisiana.

This is a comparatively recent development of the past three or four years. It means that the oil industry is compelled to readjust some of its previous ideas and conclusions, to encompass the possibilities of this great petroleum reserve created by the shifting position of the Mississippi delta and its deposits, building in a shallow sea what is now the state of Louisiana.

It means, in terms of practical business, that the alert merchandising men of the industry must take into consideration the vast potentialities of this state in making their plans for the future—the factors of accessibility and transportation in the location of their factories and assembly plants.

Detailed information on this fascinating subject may be obtained by writing to—

DEPARTMENT OF CONSERVATION

126 NEW COURTHOUSE BLDG.,
New Orleans, La.

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Autumn, 1937

CONSERVATION AND CO-OPERATION

By WILLIAM G. RANKIN, Commissioner
Department of Conservation

Co-operation is an over-worked word—sometimes I would like to see it thrown over-board—but there is no other word that so precisely expresses what we are dependent on in the enforcement of our conservation laws.

Theoretically the law, if not sacred, is something that is respected and observed by our average citizen —it is only in the case of an unjust or very unpopular law, such as the prohibition amendment, that we witness a widespread break-down in its observance, a laxity in its enforcement.

It is true that the law derives its just force from the consent of the governed—but those who write our laws, while they may be erudite and have the interests of the state at heart, have not always seen eye to eye with Mr. Average Citizen, so that when the latter gets off to himself, hunting or fishing or trapping, and thinks the odds of getting caught are in his favor, his mathematical education appears to be deficient and he may lose count of his catch or take.

Who am I to sit in judgment on a fellow whose mathematical education is deficient? When I say Mr. Average Citizen I am perhaps stretching it a bit—indeed, he may be the exception to the rule. But here in the Department of Conservation we really need this fellow's co-operation—it isn't the "beyond the limit" fish that he catches and perhaps throws away—it isn't just that one individual—it is the thousands, the hundreds of thousands, of fishermen and potential fishermen who hold the future happiness of this state in their hands.

When you try to picture something in the future the critics may put you down as a visionary—but we have only to turn our eyes westward to the dust storm areas which have suffered from soil erosion and the loss of timber and top soils to get a graphic picture of what a constructive conservation policy means to any state. True, it is not the fear of drouth that haunts us here; but we have other problems and obstacles to surmount if we are to realize the full harvest of those natural resources with which Nature has endowed us.

Evolution of Conservation

Our conservation laws were originally designed to protect our wild life, to provide fish and game sanctuaries. With the exhaustion of our timber resources these laws were extended to provide for reforestation and forest fire protection; and as our oil and natural gas industry developed it was included to prevent the waste and dissipation of this important resource. Now with the expansion of industry in our state we see a conflict of interests, and this will doubtless be extended along a wider and wider front. Reclamation of our swamps for agricultural and industrial purposes will gradually reduce the areas set aside for our wild life, for hunting, fishing and trapping.

I think that as a public policy we should always bear in mind we can never re-create or replace the conditions here in Louisiana that Nature has taken aeons and aeons, uncounted time, to produce. All of our land was once under the open sea, and the alluvial deposits of the greatest current of fresh water in the world in its convergence with the salt water of this sea has created our marsh land and those peculiar conditions and food elements so favorable to our marine life.

Surely on our high land we may locate those sites for industry without further encroachment on the

areas that have been set aside as wild life refuges.

And who stands to profit by such a public policy? Industry itself. Even now the far-sighted industrial managers of the North and East are giving a great deal of thought to what their workers are doing outside of working hours, what form of recreation and diversion may be offered to keep them contented. Henry Ford's plan was to combine factory and farm-work—each of his workers to operate a small farm on his off days—but that appears to be all work and no play, even though very good for the health, no doubt.

Here in Louisiana let us adopt Mr. Ford's principle of providing his workers with something to do in their leisure hours—but improve on it. Make it entertaining, exciting, stimulating—what happens?

Industry is assured of a dependable labor supply that is satisfied with its environment, less easily influenced by outside agitators and alien isms.

A Day of Planning

Why should we leave these leisure hours of our workers to chance, to accident? This is a day of planning—on every side we see planning boards, planning this and that. Some good and some not so good—but planning, nevertheless.

What I have in mind is that while a fair proportion of our male population are sportsmen, they are what might be termed accidental sportsmen—there is no process of planning or education by which our youngsters are brought in contact with our hunting and fishing facilities. We have Summer camps for our boys, but they are rather sporadic—they are not a part of our educational system, designed to create a life-long love of fishing and hunting. Of course it is not to be expected that every boy will turn out to be an Isaac Walton, any more than we might be assured of a Bobby Jones or Bill Tilden; but we educate him in the technique, we familiarize him with the background—and let Nature take its course.

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Interview With A Prominent Catfish

I'm not much to look at, as you will see by my picture. I never took a prize in a beauty contest, but evidently the Editor of the Louisiana Conservation Review thinks I am important enough to rate a preferred position in his magazine—more important than a "depression" banker or Hollywood movie queen with her legs crossed.

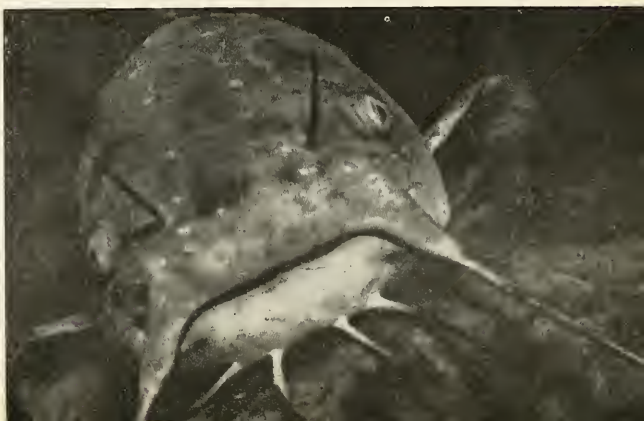
Quite true, I do not belong to the species of game fish that gladden the heart of the sportsman—I do not put up a fight for my life like the flashy tarpon, nor do I belong to the aristocracy of the king mackerel and speckled trout. Nevertheless there must be something about me that appeals to a large section of the human populace and makes me very popular with the commercial fisherman. After giving it some thought, if thinking is possible in the case of a poor fish, I have reached the conclusion that my popularity is primarily due to my protean ability of adapting myself to the art of the cuisine and assuming the guise of other fishes that have less poundage to offer.

Believe it or not, Mr. Ripley, four and a half million pounds of catfish were taken from Louisiana waters last year, yielding the fishermen a revenue of over $400,000, which was nearly as much as ten million pounds of buffalo fish brought at the market. I don't imagine it is my sex appeal—it must be my edible qualities.

Naturally I have been worried by all this agitation of fishing stream pollution by industrial plants. Personally, I am on the side of the conservationists, as I would much prefer to appear on the table as tenderloin trout than to be taken off in my prime by some queer acid with which I am not at all familiar. It is a subject for debate, however, and I would like very much to hear from Mr. G. B. Shaw. But not Gertrude Stein. Gertrude doesn't speak my language.

You would never think it to look at me, but there is an aesthetic side to my nature that makes an untimely or inappropriate end most distasteful to me.

And that fishy look in my eye might even lead one to suspect that I am related to some of the higher forms of animal life, which I would like to disavow. I am just a poor fish—but who knows? Some day the redfish may flounder and I may yet be bouillabaisse.—W. B.



Lady Luck Yields To Science In The New Bonanza Land

By
WILL BRANAN

The day of the prospector's divining rod has passed. The lucky strikes, the Eldorados of gold and silver and oil, have given place to the onward march of science.

It may be true that luck still plays a part in the search for black gold, just as it, plays a part in the life of the pedestrian who escapes the hazard of the automobile to slip up on the bath-room rug, but it is no longer the determining factor.

In no other part of the globe at the present time is this better illustrated than in South Louisiana, where science is coming to the aid of enterprise in prospecting for the hidden treasure that lies under the surface of land and water, deep down in the sedimentary deposits of a great river and its prehistoric predecessor, on the flanks of salt domes that were pushed up along the northern shore of the Gulf of Mexico, with the recession of that shallow sea which is now the state of Louisiana.

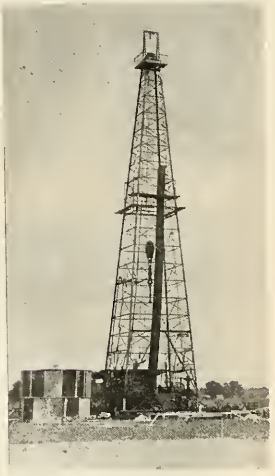
Now it is brains and money, money and brains, against the dragon that stands guard over the treasure in its hidden cavern. No knight in shining armor ever fought for his Princess more valiantly than the oil prospectors and drillers are now fighting for the fortunes that were cached by Nature in her inexorable processes hundreds of thousands, millions of years ago.

No longer is it the "hit or miss" surface prospecting of the old-timer with pack on his back. Now the seismograph crews are moving over the terrain, swamp and marsh-land, as the vanguard of an army advances on the outposts of the enemy—no sector is left unchecked, no area unplotted.

Jennings Redivivus

There was something of an oil boom in southwest Louisiana about thirty years ago when two hundred and fifty shallow wells were drilled in the Jennings field; but this field remained quiescent until the revival of interest throughout Southern Louisiana with deeper drilling and new prolific sands were encountered on the flanks of its dome.

First came the geologists with their studies and theories as to the geological formations throughout this section and the conditions under which they were created. Dr. Howe and Dr. Russell have advanced the theory that the thick petroliferous tertiary column of the Gulf Coast Geosyncline was originated under the same depositional conditions that are taking place in the Lower Mississippi River Delta to-day.



Discovery well of Ville Platte field—a tribute to geological research and exploration.

The new discovery well of the Continental Oil Company north of Ville Platte, in Evangeline Parish, bears out the theory that the oil bearing Sparta formation was created under those depositional conditions that were building the state of Louisiana in geological periods aeons and aeons ago.

The Latter-Day Dragon

It has been no easy task to follow the surface indications of gas and oil, to subdue the dragon at the mouth of the cavern. The mosquito may not be a dragon, but it has some of the same blood-thirsty characteristics. After seven years of persistent fighting in the face of every conceivable impediment, after nearly a million dollars had been spent, after Humble and Gulf were so discouraged that they resigned in favor of the Venice Corporation, Tidewater brought in a producer in the Venice field, near the mouth of the River. Rigs were blown up by gas, blown down by storm; drill bits were broken off and lost, wells abandoned; and the pay-off only came when the third well was down nearly 7,000 feet.

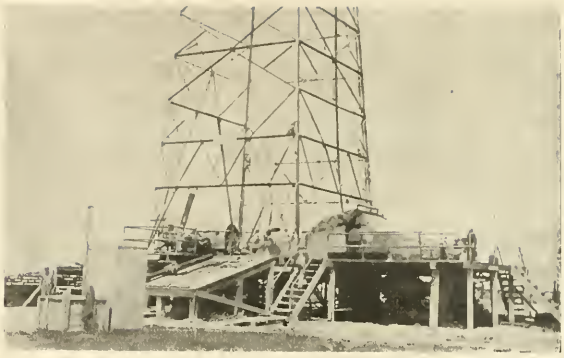
At the beginning the clay for "mudding" was brought in by pirogue and flat-boats, but later on canals were dug at a stupendous cost—and the paleontologists moved in. It was science with its electrical logging devices, its cameras for taking pictures several thousand feet under the earth's surface, its microscopic examination of the "bugs" that characterized various formations and indicated approach to oil sand—these held the driller to his charted course.

In many cases this charting or plotting is being done by long dis-

tance, by some high-brow geologist in New Orleans or New York, Tulsa or Houston. He is using his head instead of his feet and he generally has a more accurate picture of what will be encountered than the driller on the job. He may not get his feet wet, literally, but he may cost his company a lot of money. It is not possible to operate in the Louisiana coastal waters on a shoe-string. To sink a 12,000 foot well will cost anywhere from $100,000 to $150,000; and where it is necessary to dig a canal through the marsh-land another $50,000 many be added. But after the original investment these canals are an asset, in transporting the crude product to the refinery; and southern Louisiana is fortunate in having an intricate system of inland waterways, bayous and canals, which means cheaper transportation.

Usually the scientist is not a business man—and while the petroleum geologist may supply the essential information to guide in exploration work and drilling he does not generally promote or manage the operation. A notable exception to this rule is Julius Fohs, who developed the English Bayou field and now has a producer at Long Lake. Mr. Fohs was the geologist of the Mexia field in Texas and through his intimate association with the promoter of that field he was able to retire with a nice little fortune of several million dollars. But the depression put some of his gilt-edged securities through the shrinking process, so that he had only a modest stake when he entered Louisiana three or four years ago. But he had the scientific training so desirable in exploration work; he had sufficient capital to carry out his theories and to-day he is rated one of the most successful operators in south Louisiana.

Fohs is not only a geologist of international reputation; he is widely known as a philanthropist. In New York he maintains a home for under-privileged girls and this past Summer he was taking time out to help locate a new water supply for the city of Jerusalem.



The new North Crowley field.

2,000 Oil Wells

Counting the "stripper" wells of north Louisiana there are approximately 2,000 crude oil producers in Louisiana; about 1300 gas wells. An average of two new fields are being brought in every month, from fifteen to twenty new wells every week.

The drillers are closing in on New Orleans, which many people are convinced will be the new capital of the oil world. Within a radius of one hundred miles there are over twenty oil fields, many of them discovered within the past few months. The Bayou Des Allemands field is only eighteen miles from New Orleans by air line; Lafitte, twenty-two miles; Lake Long, thirty miles; Lake Hermitage, thirty miles; Harang, thirty miles; Lake Washington, forty miles; Darrow, fifty miles; Sorrento, fifty miles. Humble Oil & Refining Company brought in the world's deepest producer in the Lirette field, near Houma, eighty miles from New Orleans.

Production of crude oil in Louisiana is now running over a quarter million barrels daily; it would greatly exceed this volume but for the conservation measures now in force. Commissioner William G. Rankin, of the Department of Conservation, has estimated the gross revenue of the state from crude oil, natural gas and carbon black for 1937 at approximately $125,000,000.

"The geologists tell us that Louisiana has one of the world's greatest petroleum reserves," said Mr. Rankin, "and we can certainly see evidence of it in every direction. During the past year we have made greater progress in exploration and drilling than any other state. We have pioneered in deeper drilling, in the perfection of paraphernalia and devices for under-water drilling. But we have barely scratched the surface and I would not be surprised to see an intensive development of our oil potentialities in the light of laboratory and field research that is now being made by our geologists and geophysicists."

Liquefied Petroleum Gases

Liquefied petroleum gases are being actively developed and form the basis of one of the most rapidly growing young industries. That this comparative newcomer is assured of a secure future position among household and commercial fuels is indicated by consideration both technical and economical. These fuels may be advantageously transported, handled and stored as liquids in tank-cars, cylinders, tank-wagons, etc., and utilized as vapor in standard gas burner equipment in the home, dining cars, aircraft, and industrial plants. Their chief use, however, has been to make the advantages of gas available beyond the range of natural gas mains, that is, on the farm, summer home or in the isolated community.

Oil and Gas Wells Completed in South Louisiana During 2nd Quarter of 1937

Field	Name of Company	Name of Well	Date Completed	Initial Daily Production	Size Choke (Inch)	Gravity	Total Depth (Feet)
Basile (Acadia Parish)	Continental Oil Co.	Homeseekers #A-9	4/17/37	55 Bbls.	3/16	62.4	8,320
	Continental Oil Co.	Homeseekers #D-2	4/28/37	184 Bbls.	5/32	32.6	8,323
	Continental Oil Co.	L. L. Welch #4-7	4/17/37	338 Bbls.	3/16	33.0	8,309
	Continental Oil Co.	P. W. Miller #4	5/14/37	611 Bbls.	1/4	36.0	8,316
	Continental Oil Co.	L. L. Welch #4-8	5/20/37	238 Bbls.	3/16	32.8	8,306
	Continental Oil Co.	Vincent Welch #1	5/31/37	241 Bbls.	10/64	37.0	8,317
Big Lake (Cameron Parish)	Union Sulphur Co.	J. O. Hebert #1	5/18/37	556 Bbls.	1/4	40.0	8,336
Caillou Island (Terrebonne Parish)	The Texas Company	State Caillou Island #47	4/6/37	242 Bbls.	10/64	36.7	4,537
	The Texas Company	State Caillou Island #41	5/20/37	1,222 Bbls.	3/8	36.1	4,652
	The Texas Company	State Terrebonne Bay #3	5/5/37	482 Bbls.	1/4	32.7	6,690
	The Texas Company	State Calliou Island #48	6/5/37	980 Bbls.	3/8	23.9	3,729
Cameron Meadows (Cameron Parish)	Burton-Sutton Oil Co.	Cameron Parish School Board #18	5/10/37	450 Bbls.	1/4	25.2	3,650
Darrow (Ascension Parish)	Humble Oil & Refg. Co.	Humble Community #15	4/28/37	450 Bbls.	1/4	33.7	5,691
	Humble Oil & Refg. Co.	Val E. Landry #1	5/31/37	786 Bbls.	1/4	39.3	6,995
East Hackberry (Cameron Parish)	The Texas Company	State East Hackberry #21	5/13/37	770 Bbls.	1/4	36.2	7,631
English Bayou (Calcasieu Parish)	Fohs Oil Co.	First National Bank #1	5/4/37	184 Bbls.	1/4	42.7	7,046
	Fohs Oil Co. (Gas)	O. H. Castle #18	6/18/37	*1MCF			7,404
	Union Sulphur Co.	O. H. Castle #7	6/6/37	682 Bbls.	1/4	44.2	7,123
	Union Sulphur Co.	Kaufman #5	6/19/37	176 Bbls.	18/64	45.0	7,052
Garden Island Bay (Plaquemines Pb.)	The Texas Company	State Garden Island Bay # 23	4/10/37	225 Bbls.	3/8	35.6	5,730
	The Texas Company	State Garden Island Bay #21	6/5/37	256 Bbls.	1/8	39.9	5,020
Gillis (Cameron Parish)	The Texas Company	Nickerson (Fee) #12	4/12/37	330 Bbls.	1/4	37.5	6,718
	Union Sulphur Co.	Powell #12	4/26/37	304 Bbls.	20/64	35.9	6,714
Harang (LaFourche Parish)	Pan American Production Co.	Harang, et al #2-A	4/6/37	537 Bbls.	1/4	32.2	5,390
	Pan American Production Co.	Harang #4	5/18/37	662 Bbls.	1/4	34.0	5,400
	Pan American Production Co.	Harang et al #1-4	6/28/37	611 Bbls.	1/4	33.1	5,415
	Pan American Production Co.	Harang #5	6/15/37	675 Bbls.	1/4	33.5	5,915
	Pan American Production Co.	Harang #6	6/15/37	610 Bbls.	1/4	33.1	5,410
Iberia (Iberia Parish)	Wm. Helis	Bullock #4	4/12/37	356 Bbls.	3/8	25.0	3,991
	Wm. Helis	Bullock #5	6/14/37	825 Bbls.	5/16	28.6	5,110
	Canal Oil Co.	Berard #8	5/14/37	800 Bbls.	1/4	26.9	4,780
	The Texas Company	J. P. Duhe #2	5/4/37	1,286 Bbls.	3/8	26.7	4,454
	The Texas Company	H. C. Hanszen #B-5	4/19/37	1,155 Bbls.	3/8	26.2	4,736
Iowa (Calcasieu Parish)	Shell Petroleum Corp.	F. Heyd #23	5/10/37	522 Bbls.	1/4	25.7	4,440
	Shell Petroleum Corp.	F. Heyd #24	6/4/37	561 Bbls.	16/64	27.5	4,480
	Shell Petroleum Corp.	F. Heyd #25	6/24/37	540 Bbls.	1/4	25.6	4,450
Jennings (Acadia Parish)	Glassell & Glassell	Gus Trushel, et al. #1	4/8/37	579 Bbls.	7/32	40.2	7,020
	Superior Oil Co.	Wm. Leckelt #2	4/15/37	160 Bbls.	12/64	40.4	6,877
	W. T. Burton	J. J. Robira et al #1	5/30/37	649 Bbls.	1/4	41.0	6,804
	S. Rhodes	Iowa-Jennings #1	5/1/37	153 Bbls.	1/4	31.4	3,826
	Superior Oil Co.	Eunice-Crowley #2	5/4/37	220 Bbls.	12/64	27.0	4,249
	Superior Oil Co.	Jennings-Heywood #2	5/9/37	648 Bbls.	14/64	41.1	6,497
	Shell Petroleum Co. (Gas)	Conover Community #2	5/4/37	3½ MCF			7,052
	Cosmo Petroleum Corp.	Heywood #11	6/25/37	8 Bbls.	Pump	22.0	1,748
	Glassell & Glassell	Robert McFarland #1	6/18/37	810 Bbls.	1/4	41.0	6,808
	Glassell & Glassell	Gus Trushel #2	6/18/37	826 Bbls.	1/4	41.6	7,154
	Stanolind Oil & Gas Co.	Haussiere-Latrielle #18	6/23/37	513 Bbls.	3/8	26.0	7,980
	Superior Oil Co.	Jennings-Heywood #3	6/21/37	842 Bbls.	1/4	41.4	6,754
	Superior Oil Co.	Wm. Leckelt #3	6/1/37	648 Bbls.	14/64	41.0	6,730
Jeanerette (St. Mary Parish)	Herton Oil Co.	Rufus C. Banta #8	5/9/37	779 Bbls.	1/4	36.5	6,660
	Herton Oil Co.	W. J. Carter #6	5/8/37	768 Bbls.	1/4	38.2	7,041
	Herton Oil Co.	Roane & Banta #2	6/14/37	864 Bbls.	1/4	36.4	6,649
Lafitte (Jefferson Parish)	The Texas Company	LLE Lafitte #6	5/3/37	1,282 Bbls.	3/8	35.7	10,064
	The Texas Company	Rigolets Coop. Fur Co. #7	6/30/37	1,350 Bbls.	3/8	32.6	10,406
Lake Barre (Terrebonne Parish)	The Texas Company	State Lake Barre #37	5/4/37	515 Bbls.	1/4	30.5	3,763
Lake Long (LaFourche Parish)	Fohs Oil Co.	State Lake Long #1	6/22/37	804 Bbls.	1/4	38.3	9,406
Lake Pelto (Terrebonne Parish)	The Texas Company	State Lake Pelto #16	5/13/37	804 Bbls.	3/8	36.6	7,136
Leesville (Terrebonne Parish)	The Texas Company	LLE Leesville #58	4/28/37	1,350 Bbls.	3/8	35.4	4,840
	The Texas Company	LLE Leesville #81	4/24/37	708 Bbls.	1/2	28.2	3,905
	The Texas Company	LLE Leesville #64	5/24/37	1,221 Bbls.	3/8	36.5	4,422
	Gulf Refining Co.	Allan Land Co., Inc. #12	6/15/37	643 Bbls.	3/8	27.5	3,797
	The Texas Co.	LLE Leesville #54	6/30/37	128 Bbls.	1/4	37.0	4,076
	The Texas Co.	LLE Leesville #65	6/3/37	611 Bbls.	3/8	32.9	4,084

*MCF—Million Cubic Feet of Gas—the open flow capacity of a gas or distillate well.

(Continued on Page 10)

Oil and Gas Wells Completed in North Louisiana During 2nd Quarter of 1937

Field	Name of Company	Name of Well	Date Completed	Initial Daily Production	Size Choke (Inch)	Gravity	Total Producing Depth (Feet)
Bull Bayou (Red River Parish)	Gulf Refining Co.	L. E. Kennedy #26	4/17/37	48 Bbls.	Pump	41.2	2554
	Gulf Refining Co.	E. T. Robinson #39	4/5/37	43 Bbls.	Pump	41.5	2550
	Gulf Refining Co.	L. E. Kennedy #27	5/18/37	70 Bbls.	Pump	41.6	2553
	Gulf Refining Co.	E. T. Robinson #40	5/3/37	46 Bbls.	Pump	41.3	2553
	Gulf Refining Co.	E. T. Robinson #41	6/9/37	62 Bbls.	Pump	41.6	2553
Converse (Sabine Parish)	Earl F. Fox (Gas)	L. B. Blankenship #1	5/1/37	2 MCF*			3412
	W. G. Ray Drilling Co.	Burkett #3	5/14/37	60 Bbls.	Pump	46.0	1525
Cotton Valley (Webster Parish)	Ohio Oil Company (Dist.)	S. P. D. Coyle #1	6/20/37	305 Bbls.	3/8	74.0	8452
	Ohio Oil Company (Dist.)	R. M. Coyle #2	6/29/37	397 Bbls.	3/8	60.0	8503
	Ohio Oil Company (Dist.)	A. J. Hodges #2	6/19/37	470 Bbls.	3/8	74.8	8517
	Ohio Oil Company (Dist.)	A. G. Gray et al #2	6/8/37	390 Bbls.		60.0	8439
	Woodley Petroleum Co. (Dist.)	A. H. Gray #4-B	6/9/37	500 Bbls. & 5½ MCF	3/8	74.0	8547
Driscoll (Bienville Parish)	Lide, Greer, Brown & Marr (Gas)	W. J. Smelley #B-1	6/5/37	55 MCF			71.80
Lisbon (Claiborne Parish)	DeArman & McMillan	Mrs. Maggie Patton #1	4/27/37	528 Bbls.	14/16	34.6	5295
	Love, et al	H. E. Patton #1	4/29/37	672 Bbls.		34.8	5350
	P. W. Woodruff, et al	H. E. Patton #1	4/2/37	720 Bbls.	28/64	34.8	5314
	J. B. Bond	W. E. Patton #2	5/21/37	310 Bbls.	25/64	34.9	5290
	DeArman & McMillan	H. E. Patton #1	5/9/37	313 Bbls.	21/64	34.5	5253
	DeArman & McMillan	M. Patton #B-1	5/18/37	353 Bbls.	19/64	34.5	5293
	DeArman & McMillan	M. Patton #A-2	5/21/37	518 Bbls.	23/64	34.6	5315
	DeArman & McMillan	M. Patton #B-2	5/31/37	420 Bbls.	20/64	34.5	5288
	DeArman & McMillan	Bertha Vaughn #1	5/7/37	456 Bbls.	20/64	34.8	5313
	P. W. Gill, et al	McDonald #B-1	5/31/37	365 Bbls.	19/64	34.5	5286
	Gulf Refining Co.	Eva Bennett #1	5/3/37	792 Bbls.	18/64	34.6	5349
	Gulf Refining Co.	H. E. Patton #1	5/1/37	396 Bbls.	34/64	34.8	5324
	Gulf Refining Co.	H. E. Patton #2	5/11/37	810 Bbls.	16/64	34.8	5334
	Gulf Refining Co.	H. E. Patton #3	5/10/37	528 Bbls.	14/64	34.6	5310
	Gulf Refining Co.	H. E. Patton #4	5/11/37	462 Bbls.	16/64	34.6	5275
	T. L. James Co.	H. W. Patton #1	5/8/37	583 Bbls.	22/64	34.6	5311
	T. L. James Co.	H. W. Patton #2	5/4/37	480 Bbls.	1/8		5347
	Love Petroleum Co.	H. E. Patton #3	5/4/37	324 Bbls.	3/8	34.8	5335
	Lyons & Neely	Maggie Patton #1	5/2/37	450 Bbls.	1	34.5	5271
	Lyons & Neely	Maggie Patton #A-2	5/23/37	360 Bbls.	3/8	34.5	5285
	Magnolia Petroleum Co.	H. E. Patton #1	5/29/37	341 Bbls.	13/64	34.5	5336
	Ray P. Oden	H. E. Patton #1	5/18/37	319 Bbls.	1/4	34.5	5287
	Oden-Evans, et al	H. W. Patton Estate #2	5/15/37	477 Bbls.	3/8	34.5	5357
	P. W. Woodruff	T. E. Patton Estate #1	5/30/37	428 Bbls.	16/64	34.5	5302
	P. W. Woodruff	H. E. Patton #2	5/3/37	1,584 Bbls.	24/64	34.6	5300
	Atlantic Refining Co.	F. B. King #1	6/10/37	528 Bbls.	5/16	34.6	5222
	J. B. Bond	Patton #1	6/22/37	492 Bbls.	26/64		5273
	DeArman & McMillan	H. E. Patton #2	6/4/37	528 Bbls.	21/64	34.6	5257
	DeArman & McMillan	Roberta Vaughn #2	6/22/37	260 Bbls.		34.8	5284
	Gulf Refining Co.	Eva Bennett #2	6/7/37	594 Bbls.	22/64	34.5	5330
	Gulf Refining Co.	J. J. Henry #1	6/17/37	360 Bbls.	16/64	34.2	5214
	M. A. Halsey	Vaughn #1	6/10/37	396 Bbls.	16/64	36.4	5283
	Harry Hanbury	D. O. & P. D. McDonald #1	6/23/37	324 Bbls.	27/64	34.6	5270
	Hollyfield & McFarlane	Maggie Patton #1	6/17/37	777 Bbls.	26/64	34.6	5320
	Love Petroleum Corp.	H. E. Patton #2	6/4/37	390 Bbls.	3/8	34.5	5306
	Lyons & Neely	M. Patton #B-1	6/5/37	340 Bbls.	3/8	34.5	5279
	Lyons & Neely	Maggie Patton #B-2	6/13/37	363 Bbls.	1/4	34.6	5280
	Lyons-Neely & Delta Drilling Co.	H. E. Patton #2	6/1/37	492 Bbls.	1/2	34.5	5244
	Magnolia Petroleum Co.	S. M. English #1	6/5/37	1,296 Bbls.	1/2	34.5	5298
	Magnolia Petroleum Co.	S. M. English #2	6/28/37	324 Bbls.	5/16	34.8	5281
	Ray P. Oden	H. E. Patton #2	6/23/37	324 Bbls.	20/64	34.6	5307
	Standard Oil Co.	F. B. King et al #1	6/15/37	336 Bbls.	16/64	34.6	5306
	P. W. Woodruff	McDonald #A-1	6/28/37	726 Bbls.	22/64	34.6	5252
	DeArman & McMillan	H. E. Patton #B-2	6/5/37	388 Bbls.	3/8	34.6	5257
(Lincoln Parish)	Lyons & Neely & Delta Drilling Co.	Eva Bennett #1	5/21/37	528 Bbls.	3/8	34.6	5342
	Lyons & Neely & Delta Drilling Co.	J. D. Carathers #1	6/17/37	396 Bbls.	20/64	34.6	5320
Monroe (Morehouse, Ouachita and Union Parishes)	United Gas System (Gas)	Crossett #47	6/14/37	9 MCF			2228
	United Gas System (Gas)	Crossett #48	6/29/37	5 MCF			2228
	United Gas System (Gas)	Crossett #49	6/9/37	8½ MCF			2237
	United Gas System (Gas)	Crossett #51	6/25/37	7 MCF			2246
	Hope Producing Co. (Gas)	Cole Heirs #8	6/20/37	2½ MCF			2171
	J. & H. Oil Co. (Gas)	Frost Lbr. Ind. #A-2	6/5/37	1 MCF			2181
	Interstate Nat. Gas Co. (Gas)	Fee Min. #64	6/8/37	15 MCF			2142
	Interstate Nat. Gas Co. (Gas)	Fee Min. #65	8/23/37	12½ MCF			2127
	Interstate Nat. Gas Co. (Gas)	Fee Min. #66	6/12/37	14½ MCF			2128
	Interstate Nat. Gas Co. (Gas)	Fee Mon. #68	6/17/37	11 MCF			2159
	Southern Carbon Co. (Gas)	Grayling #18	6/29/37	15 MCF			2058
	Interstate Nat. Gas Co. (Gas)	Fee Min. #69	5/29/37	11½ MCF			2160
	H. L. Woods (Gas)	Frost Lbr. Ind. #1-B	5/13/37	1 MCF			2192
Pine Island (Caddo Parish)	G. R. C. Oil Co.	J. H. Herndon #5	4/30/37	45 Bbls.			1600
	Stanolind Oil & Gas Co.	Dillon #120	4/2/37	150 Bbls.		33.9	1665
	Stanolind Oil & Gas Co.	Slattery #11	4/21/37	70 Bbls.	Heads	39.6	1580
	Stanolind Oil & Gas Co.	Dillon #121	5/6/37	84 Bbls.	Pump	34.9	1680
	Stanolind Oil & Gas Co.	Dillon #122	5/11/37	65 Bbls.		37.2	1665
	Stanolind Oil & Gas Co.	A. R. Wherritt #1	5/25/37	46 Bbls.		34.8	1640
	Interstate Drilling Co.	E. Smith #1	6 5/37	5 Bbls.		42.5	1653
	Tom Pappas, et al	Spell #2	6/27/37	100 Bbls.		38.0	1652
	Stanolind Oil & Gas Co.	Dillon #123	6/6/37	45 Bbls.		35.2	1670
	Stanolind Oil & Gas Co.	J. B. Slattery #12	6/25/37	56 Bbls.		41.0	1674

*MCF means millions cubic feet of gas—the open flow capacity of a gas or distillate well.

(Continued on Page 10)

Oil and Gas Wells Completed in North Louisiana During 2nd Quarter of 1937

Field	Name of Company	Name of Well	Date Completed	Initial Daily Production	Size Choke (Inch	Gravity	Total Producing Depth (Feet)
Rodessa (Caddo Parish)	Gulf Refining Co.	M. G. Campbell #1	4/23/37	240 Bbls.	4/8	43.0	6050
	J. E. Jones	M. Z. Sharp #A-4	4/25/37	79 Bbls.	33/64	43.6	6045
	J. E. Jones	M. Z. Sharp #B-2	4/26/37	72 Bbls.	12/64	43.6	6070
	Lion Oil Refg. Co.	Gaddie Holm #1	4/25/37	840 Bbls.	1/2	43.0	6042
	Magnolia Petroleum Co.	Norton-Levee Board #11	4/19/37	480 Bbls.	1/4	44.2	5980
	R. W. Norton	W. N. Starcke #4	4/25/37	252 Bbls.	1/4	44.1	5918
	Standard Oil Co.	L. J. Kaempler #1	4/29/37	336 Bbls.	1/2		6024
	Standard Oil Co.	W. M. Terry et al #1	4/19/37	1,152 Bbls.	1		5875
	Lyons & Neely (Gas)	W. E. Noel #2	4/8/37	3 MCF	1/4		5930
	Lyons & Neely (Gas)	W. E. Noel #1	4/9/37	4 MCF	1/4		6085
	United Gas System (Gas)	A. B. Land Unit #1	4/30/37	14 MCF			5610
	R. W. Norton	L. C. Hardin #2	5/2/37	558 Bbls.	3/8	43.0	5946
	R. W. Norton	L. C. Hardin #3	5/20/37	514 Bbls.	1/2	43.0	5956
	Standard Oil Co.	Sarah Kaempler #1	5/2/37	696 Bbls.	1/2		6001
	United Gas System	Fee #574-6	5/24/37	235 Bbls.	28/64	43.2	5992
	United Gas System	Bremer Unit #9	5/15/37	194 Bbls.	1/4	43.9	6014
	United Gas System	Starcke #1	5/8/37	637 Bbls.	24/64	43.4	5948
	Drillers Inc.	Glassell-Means #1	5/28/37	50 Bbls.		42.0	6076
	R. W. Norton	W. N. Starcke #5	6/16/37	518 Bbls.	3/8	44.8	5973
	Standard Oil Co.	Armistead Community #3	6/6/37	306 Bbls.	25/64	43.2	6013
	Standard Oil Co.	L. J. Kaempler #2	6/25/37	144 Bbls.	28/64	42.8	5988
	Standard Oil Co.	Sarah Kaempler #2	6/14/37	544 Bbls.	25/64	43.0	5988
	Standard Oil Co.	Sarah Kaempler #3	6/15/37	621 Bbls.	25/64	43.0	5978
	Surl Oil Company	Mary Self Rodgers #2	6/12/37	80 Bbls.		25.0	2205
	United Gas System	Fee #574-7	6/26/37	336 Bbls.	3/8		5940
	United Gas System	W. Starcke #2	6/21/37	504 Bbls.	3/8		5955
	United Gas System (Gas)	I. L. Young #5	6/2/37	51 MCF			6790
Sligo (Bossier Parish)	United Gas System	A. C. Skaanal #I-1	4/8/37	345 Bbls.	1/4		5175
	Ark.-La. Gas Co. (Gas)	Tom Wilson, Sr., #1	4/16/37	27 MCF			4274
	United Gas System (Gas)	Webb Unit #A-1	4/13/37	20 MCF			5172
	Triangle Drilling Co.	Stais #A-2	5/5/37	125 Bbls.	1/4	39.6	5170
	United Gas System	Roos Unit #2	5/5/37	200 Bbls.			5180
	United Gas System (Dist.)	Jeter Unit #A-1	6/17/37	40 MCF		62.0	5158
Urania (La Salle Parish)	Air Lift Oil Co.	Urania Lbr. Co., Hartner #C-11	4/5/37	30 Bbls.		21.0	1523
	Air Lift Oil Co.	Urania Lbr. Co., Hartner #C-12	4/16/37	35 Bbls.		21.0	1515
	E. R. Waller	Priagle #2	4/25/37	150 Bbls.			1526

Oil and Gas Wells Completed in South Louisiana During 2nd Quarter of 1937

Field	Name of Company	Name of Well	Date Completed	Initial Daily Production Bbls.	Size Choke (Inch)	Gravity	Total Depth (Feet)
Lirette (Terrebonne Parish)	Humble Oil & Refg. Co.	H. J. Ellender #1	5/21/37	696 Bbls.	1/4	38.0	12,102
Roanoke (Jeff. Davis Parish)	Shell Pet. Corp. (Distillate)	J. Sturdivant #1	4/22/37	10 Bbls. & 3 MCF		48.0	8,558
	Humble Oil & Refg. Co.	J. W. DeVilbiss #B-8	5/11/37	675 Bbls.		37.0	8,841
St. Martinville (St. Martin Parish)	Tide Water Associated Oil Co.	Smedes Bros. #3	5/9/37	611 Bbls.	1/4	31.0	5,565
Sulphurmines (Calcasieu Parish)	Union Sulphur Co.	Fee #768	4/18/37	48 Bbls.	24/64	27.0	4,781
	Union Sulphur Co.	Fee #842	4/19/37	409 Bbls.	1/4	25.0	5,056
	Union Sulphur Co.	Fee #844	4/27/37	330 Bbls.	16/64	32.0	5,189
	Union Sulphur Co.	Fee #845	5/30/37	260 Bbls.	20/64	38.0	4,902
Vinton (Calcasieu Parish)	Woodley Petroleum Co.	Matilda Gray #1	5/18/37	180 Bbls.	Pump	31.5	
West Hackberry (Cameron Parish)	Burton-Sutton Oil Co.	Robert Ellender #1	4/5/37	486 Bbls.	1/4	32.1	4,866
	Stanolind Oil & Gas Co.	School Board #A-18	4/15/37	698 Bbls.	1/4	30.1	5,928
	W. T. Burton	F. B. Kennedy #1	5/7/37	498 Bbls.	1/4	31.5	4,833
	Sutton Oil Co.	Mary Duhon #A-1	5/15/37	568 Bbls.	1/4	30.3	4,878
	Stanolind Oil & Gas Co.	Carter-Sweeney #7	6/23/37	526 Bbls.	1/4	31.6	4,322
	Stanolind Oil & Gas Co.	Mary Duhon #4	6/22/37	285 Bbls.	1/4	30.5	4,574
	Wm. T. Burton	Rosella Vincent #2	6/5/37	534 Bbls.	1/4	34.0	4,495
	Sutton Joint Account	Mary Duhon "A" #2	6/18/37	546 Bbls.	1/4	31.3	4,699

Natural Gas

Natural gas, which may be regarded as gaseous petroleum, consists primarily of methane with several other combustible gases diffused through each other. It has not been equalled by any man-made product for cheapness and efficiency.

As the average life of a natural gas well is of comparatively short duration, it is necessary in order to insure a sufficient supply that producers must be constantly hunting for new supplies to replenish depleted wells.

Of the twenty-four producing states Louisiana has the lowest field prices. This makes it peculiarly advantageous for industrial development because with so much cheap fuel production can be put on a most economical basis. In addition to the millions of cubic feet of natural gas carried through the pipe lines every twenty-four hours, carbon black plants are using millions of cubic feet. The chlorination of natural gas yields methyl chloride, chloroform and carbon tetrachloride, the latter being a good fire extinguisher.

The brine-boiling tank of a shrimp sun-drying platform.

The Mysterious But Productive Shrimp

The Louisiana coastal waters are dotted with the trawls of several thousand fishermen at this season, bringing in their catch of shrimp to the canners and sun-drying platforms. Several thousand women and girls are at work in the canneries, picking and packing the shrimp in their tin or glass containers; and many other workers are engaged in the preparation of the headless shrimp for market.

It is the most important seafood industry of the entire South. Louisiana ranks at the top of shrimp production which yields the state several million dollars yearly in revenue. The industry is under the supervision of the Fisheries Division of the Department of Conservation and the object of this article is to give our readers a clearer view of some of the commercial aspects of the industry, especially the great care that is taken to insure that the product reach the consumer's table in good condition.

Man may have faith in the immortality of his soul—he may even credit the lowly shrimp with some form of intelligence that is eternal—

And yet man, at the present time of writing, does not know what becomes of the adult shrimp that escapes the fisherman's trawl.

The theory is that the shrimp, after serving the purpose of Nature by perpetuating its species in spawning, dies a natural death at the ripe old age of around twelve months.

But it is just a theory—though it is actually known that the adult shrimp disappears from its feeding grounds in these parts and leaves no trace of its perigrinations.

The probability is that after spawning the adult *Penaens setiferus* (the lake or common variety of shrimp) seeks the deeper waters of the open Gulf, which are somewhat warmer in winter than the nursery grounds of the shallow inlets, sounds and bays. Its chances of survival are very slim as it ventures forth, and the odds are about 99 to 1 that it will provide a delicious tid-bit for the predatory fish of our coastal waters; it disappears at the end of a year and if its life span is longer there is at this time no evidence of it.

Unloading shrimp from the iceboat at the cannery.

The U. S. Bureau of Fisheries, in cooperation with the Department of Conservation and other state agencies, has been investigating the shrimp for the past several years. Hundreds of thousands of specimens, in various stages of growth, have been examined and much valuable information on the life history and characteristics of the shrimp has been assembled. Milton J. Lindner of the U. S. Bureau of Fisheries, who is in charge of the cooperative shrimp investigations, expects to extend the scope of the researches this Winter, when it is possible that some solution of the shrimp's mysterious disappearance will be obtained.

The "Pelican" of the U. S. Bureau of Fisheries, a sea-going vessel 78 feet in length and fully equipped, has been detailed for these off-shore shrimp studies. Provided with a mile of steel cable, the "Pelican" will be able to examine more completely than before the movements of the shrimp in the deep waters of the Gulf.

The shrimp, from all available evidence, is an "annual," spawned in the Spring or Summer and spawning at the same season the following year. Whether the process of spawning is fatal to the shrimp—whether they are weakened and succumb to enemies and disease or whether they retire to some new and undiscovered habitate—remain unproved.

An Important Industry

Louisiana catches half of all the shrimp taken in the entire United States and products of its shrimp fisheries are valued at several million dollars annually. Inasmuch as the life span of the shrimp is shorter than that of any other animal of economic importance the industry must obviously lack the stability shown, for example, by the halibut fishery, where animals from seven to twenty years of age appear in the catch and the entire failure of the young of any particular year would not seriously reduce the total output.

The shrimp fishing areas of Louisiana rarely extend far from shore and most frequently embrace inside waters and a coastal strip within ten miles of the shore. The principal shrimping grounds are found in the central and eastern coastal sections; very little fishing is done west of Vermilion Bay. From east to west the major fishing areas are Chandeleur Sound, the Gulf from the Mississippi Delta to Isle Derniere, Barataria Bay, Timbalier Bay, Terrebonne Bay, Atchafalaya Bay and Vermillion Bay. A few shrimp are taken in Lake Borgne, and although Lake Pontchartrain is closed to trawling some shrimp are taken there by cast-netters who dispose of their catch in New Orleans.

Most Louisiana shrimp fishermen are of French extraction, native of these regions for many years. Along the coast a trawling craft almost invariably fishes from a single port and generally for only one handling plant throughout the season; consequently the fishing grounds constitute those areas which can be

The sun-drying platform under a Louisiana sky.

reached within a reasonable length of time by the trawler or by an ice-boat in transporting the catch to port. There are, therefore, numerous breaks in the Gulf Coast line where there is little or no fishing for shrimp; not because of the absence of shrimp at their usual seasons of abundance but because of the inaccessibility of these areas.

The shrimp trawl consists of a bag in which the catch is accumulated, a wing at either side for directing the shrimp into the bag, the "otter board" or "trawl board" at the extreme end of each wing for holding them apart and tow lines attached to the trawl boards and secured to the vessel. Nets are commonly made from 1½ to 2 inch stretched mesh and vary from 22 feet to nearly 100 feet in width.

The Breeding Season

The extended breeding season of the common shrimp of at least four and a half months, in the Spring and Summer, and the vast number of eggs produced, are factors very favorable to the shrimp, since they render the failure of an entire breeding season almost impossible.

Unlike the river shrimp, crab and crayfish, which carry their eggs attached to and protected by the abdomen until hatched, the common or lake shrimp emit their ova directly in the waters. On hatching and passing through the larval stages the young shrimp move to the warm shallow inside waters which serve as a nursery ground for many other species of marine life. As the small shrimp grow they tend to seek larger bodies of water; by August they begin to appear in the commercial catch and by the end of September the young immature shrimp dominate the catch of the entire fishery.

With the approach of cold weather the larger shrimp move into the deeper and, at that season, warmer waters outside, so that during midwinter only the smaller shrimp remain inside, in the sounds, bays and bayous. As the waters become warmer in the Spring the shrimp show an increased growth rate, mature the sex products and spawn.

The Fishermen

Where fishing craft are owned by the packers, several methods of compensating the fishermen are followed. The most prevalent is for the packer to maintain the boat and equipment and figure the full market price for the catch. After deducting cost of fuel and similar expenses, the packer is allowed one-third of the receipts for the boat's share; the captain is allowed one-third and the mate one-third. In some cases the captain may receive a bonus. Where there are more than two members of the crew there are of course more shares.

The captain and mate may be paid a fixed price per pound, generally one-half the market price, and the owner assumes cost of operation.

Great care is exercised in handling shrimp to insure that they reach the markets or processing plants in good condition. Naturally a high-

Women and girls are preferred for picking shrimp in the canneries.

ly perishable sea-food, and even more susceptible to spoilage on account of the warm climate, handling must be expedited and proper icing is essential.

Shrimp trawl boats usually carry ice unless the fishing grounds are near at hand and the shrimp sufficiently abundant for the boats to land their catches within a few hours. The distance of carrying without ice may be extended somewhat in the colder months.

Culling The Catch

After the catch is landed on deck from the trawl it is culled by the crew, the small shrimp and other fish or debris thrown overboad. The marketable shrimp are then stored in the hold between layers of ice. Where ice or "buy" boats are used the trawlers seldom carry ice.

In Louisiana canning or handling plants are generally located on the bayous twenty to one hundred miles from the fishing grounds; the catch is transferred every few hours from the trawl boats to ice boats which make delivery of their cargoes to receiving plants at periods not greater than three days. When shrimp are plentiful or distance to the fishing grounds not far the trips are made with greater frequency.

The Canners

The canning of shrimp was first attempted in the establishment of G. W. Dunbar Sons at New Orleans in 1867, but it was not until this concern devised the bag lining for cans in 1875 that it met with success. By 1880 this canner was producing 1½ pound cans of shrimp at the rate of several hundred thousand each season.

It is estimated that approximately one-half of the shrimp catch is utilized in canning. When canned the weight of the shrimp meat is about one-fourth that of the whole fresh shrimp.

Shrimp brought in by the ice boats are usually ready for the pickers on arrival at the cannery, while those brought in directly by the trawlers require storage in ice over night. This chilling enables the pickers to remove the shell with much greater facility.

Shrimp Pickers

By far the greater number of wage earners in the shrimp industry are the pickers who remove the head and shell from the meat. Girls and women are generally employed for this purpose. They are paid at a fixed rate per pail or cup containing a certain volume of shrimp meats. The wage scale varies considerably in different localities, depending on the type and abundance of labor, and it has also varied greatly with the general wage declines in recent years.

The average picker will account for 170 to 180 pounds of shrimp meats a day, although pickers have exceeded 300 pounds in a day. From 175 to 200 pickers may be employed in a single cannery. Packers and laborers in most instances are paid by the hour.

At a few plants the shrimp's head is removed before it is placed in storage; fishermen sometimes head their shrimp on board boat, especially when the catch is small. This preliminary removal of the head makes the shrimp less subject to spoilage. After death the digestive juices located in the "head" (which is more properly the head and thorax or the *cephalothorax*) begin reacting on the tissues of the shrimp and accelerate the process of decomposition. Consequently by removing the head the problem of spoilage is considerably lessened. Another advantage of this procedure lies in the fact that the objectionable "black streak" or intestinal tract is largely removed when the head is taken off. After the shrimp have been dead thirty minutes or more, depending upon the temperature, heading fails to eliminate the intestinal tract.

The Hand Operation

Reports of the successful operation of mechanical shrimp pickers or peelers have been reported in recent news dispatches, but at this time in Louisiana it is entirely a hand operation. The picker grasps the body of the shrimp in the left hand, with the legs pointed outward from the hand and the head extending beyond the thumb. With the right hand the picker seizes the head and breaks it off, then inserts the thumb of the right hand between the rows of legs, breaking open the shell and peeling off a section about one inch to 1½ inches long. A pressure of the left hand on the tail of the shrimp forces the meat from the remainder of the shell.

The raw shrimp are carried in baskets from the storage bins or ice

boats and dumped on the pickers' tables. The shrimp meat is placed in pails by the pickers and carried to a small office near the blanching tanks, where the meat is weighed. It is then washed, preparatory to blanching. This washing may be accomplished by agitating in separate large open wooden tanks through two or more changes of fresh water; by transfer from compartment to compartment in tanks having provision for movement of the shrimp over slides between the compartments; by automatic conveyors passing through water having constant replacement.

Boiling the Shrimp

The next operation is the boiling or blanching of the bulk meats in brine. The most commonly employed method is the use of wooden tanks, usually cypress, at the bottom of which are steam coils for heating the brine. The strength of this brine and the length of time for cooking varies somewhat, depending on the size of the shrimp, weather conditions, whether wet or dry pack is being prepared and in the case of the wet pack the strength of the brine to be used for filling the cans. At one cannery the humidity is used as a basis to determine the duration for blanching in the dry pack—the higher the humidity the longer the cooking. Variation may also result from the request of buyers of canned shrimp seeking a product of light or heavy salt content.

In general about one pound of salt is used to the gallon of water or a 10 per cent by weight solution. Shrimp intended for wet pack are boiled from 4 to 7 minutes, while dry shrimp receive a cooking of from 7 to 11 minutes. After about four batches of shrimp have heen cooked in a single mixture the brine is changed.

Before blanching the shrimp meats are white in color, but they emerge from boiling in brine with the bright red markings so distictive of the product. After blanching the meats are either dumped into trays having heavy wire netting bottoms for cooling or in many plants they are dumped directly onto conveyors equipped with blowers to cool and dry the meats and blow out any remaining antennae or other foreign matter.

After cooling the shrimp meats are repicked for final elimination of refuse matter, then graded. Some plants grade by hand on endless conveyors by picking from the conveyor the sizes in the minority and allowing the size in predominance to be brought to the end of the conveyor, to be accumulated in receptacles there; thus, if the shrimp are running mostly medium, the small and large ones are picked out by hand, and the medium are carried to the end of the conveyor. Other plants employ mechanical graders, which are installed at the end of the conveyor used for re-picking and consist of plates, usually of aluminum, in which are holes from three to five sizes. The smaller holes are nearest the conveyor, the sizes progressively increasing in diameter as the distance from the conveyor becomes greater. The plate is inclined downward away from the conveyor and when in operation it is shaken with considerable force so that the smaller shrimp pass through the small holes to containers immediately underneath. The next size shrimp are conveyed to larger holes under which in turn are other containers, and so on, the largest shrimp passing out over the end of the grader into a container there.

The graded shrimp meats are now ready for the can. The filling of the cans is done by hand by women and girls who weigh each can to assure packages of a definite minimum weight.

Grades of Shrimp

Grades of canned shrimp vary somewhat with different plants and in the same plant may vary according to the specifications of the buyer. Typical sizes of packs in tins may be indicated by such names as "small," "medium," "fancy," "extra fancy" and "jumbo." Very small shrimp may be packed as "baby" shrimp and pieces are known as "salad" shrimp.

The last handling of the meats occurs with the packing of the shrimp in the cans or glass containers. Upon completion of this process the cans, if intended for wet pack, are carried by conveyor under a perforated pipe from which a hot

The canners are proud of the sanitary conditions that prevail in their plants.

Ernest Lapeyroux, oldest shrimp fisherman of Terrebonne Parish, and Desire Theriot, manager of a large cannery that has specialized in shrimp flavored with peppers.

brine solution of approximately 0.2 pounds of salt per gallon of water drips into them. They are then conveyed to the sealer where the lids are attached.

The glass pack is sealed under vacuum and a part of the dry pack in tin is similarly handled. However, dependence is placed on the hot brine and the heat of cooking to obtain the vacuum in most of the tin pack.

Having been sealed the cans are placed in metal baskets directly from the sealer and are raised with cranes or block and tackle and lowered into the retorts for cooking.

Processing

These baskets contain about 14 to 15 cases of No. 1 tin pack and either two or three baskets are retorted at one time. Wet pack shrimp are processed in the retorts at 250 degrees F. for ten minutes, and dry pack are processed at 250 degrees F. for 53 minutes. The glass pack is usually processed in water while the tin packs are treated with steam.

After processing the cans may be cooled either by turning cold water on them before removal from the retorts or they may be removed and cooled in wooden vats constructed for the purpose. The glass pack is cooled in the retorts under pressure to avoid blowing off the lids.

It is considered good practice not to label the containers until some ten days after processing in order that any swells, leaks or other defects may develop during this period and be eliminated before shipping.

Headless Shrimp

The quantity of fresh headless shrimp marketed each year is second only to that of canned shrimp. Based on a loss of about 39 per cent in the weight of the raw shrimp, it is estimated that approximately one-third of the total catch goes into the production of headless shrimp.

In packing headless shrimp in barrels about 125 pounds of shrimp are ordinarily packed between layers of ice with a large cake of ice on top and burlap covering the entire barrel; the gross weight of the barrel, shrimp and ice being about 300 to 325 pounds. Sometimes a layer of ice is placed on the bottom of the barrel and a long cake of ice set upright in the center.

Headed shrimp are not commonly graded, all sizes being marketed in a single package. However, sizes vary between seasons and localities, and different fishing craft may return with catches that vary considerably in size.

Sun-Dried Shrimp

In Louisiana the sun-drying of shrimp dates from 1873, when the first Chinese camps were started in the Barataria Bay region. It is figured that about 12 per cent of the total catch in the Gulf and South Atlantic states is utilized for sun-dried shrimp, this phase of the industry being restricted to Louisiana.

Sun-dried shrimp represent about 11 to 13 per cent of the weight of the whole fresh shrimp. China consumes the greater proportion of this product, but owing to internal difficulties in that country and the decline in the value of silver there has been an appreciable lessening in the demand.

The drying platforms utilize the smaller shrimp for which there is less demand from the canners. Even the little sea bob, which is always refused by the canners, will be taken for sun-drying. Because of the small size, two to four inches, a much reduced price is paid the fishermen for this species.

In the preparation for sun drying the shrimp are landed at the drying platforms and transferred to the boiling vat where the whole shrimp is boiled in brine for fifteen minutes. After boiling the shrimp are dipped from the vats and spread out on the drying platforms. These platforms are erected on posts which permit the free passage of air underneath to facilitate the drying process. The platforms are built with gently undulating surfaces in order that the shrimp may be swept to the crest of the waves and covered with tarpaulins when rains occur and at nights to keep off the dew.

The shrimp are spread out on the platforms with wooden rakes in a thickness of from two to three inches. At intervals of two or three hours laborers turn the shrimp with rakes to effect uniform drying. This drying is usually completed in the Summer-time in from three to four days, but in the Winter five to ten days may be required.

A small quantity of fresh shrimp is dried fresh without the preliminary boiling in brine. In this process the fresh uncooked shrimp are laid in wire trays and mashed with a mallet to facilitate the drying. The trays of mashed shrimp are then exposed to the sun to dry. This product commands a higher price than the boiled sun-dried shrimp but the demand is limited.

Removal of the heads and shells of dried shrimp was until recent years effected by "dancing" or tramping by laborers with shoes covered with cloths or sacks. Specially constructed devices are now employed in which the whole dried shrimp are placed. The shells and appendages are very brittle and easily broken off after drying.

Shrimp By-Products

Large quantities of waste result from the preparation of the various shrimp products for market. Approximately 44 per cent of the weight of the raw shrimp consists of such waste in the form of heads, hulls and appendages. This vast tonnage of waste, supplemented by some quantities of soft and discolored whole shrimp, is now largely discarded. Its more complete use for conversion into meal for feedstuff and fertilizer and other purposes is a possibility for additional revenue in the shrimp industry where the waste can be assembled in suitable quantities. In the past year or so it has been found to contain certain chemical ingredients that make it useful in the manufacture of paint.

Shrimp meal or "bran" may consist of the particles of hulls and waste accumulated from the drying of shrimp. It may also be prepared from the waste of shrimp picking operations, usually at canneries. This latter material is dried in a tube drier either directly from the picking tables or after receiving a preliminary crushing. The heads and hulls, if not given a preliminary crushing, may be ground after drying. The product thus prepared is sold for mixed foods, Germany being our principal foreign market for this by-product.

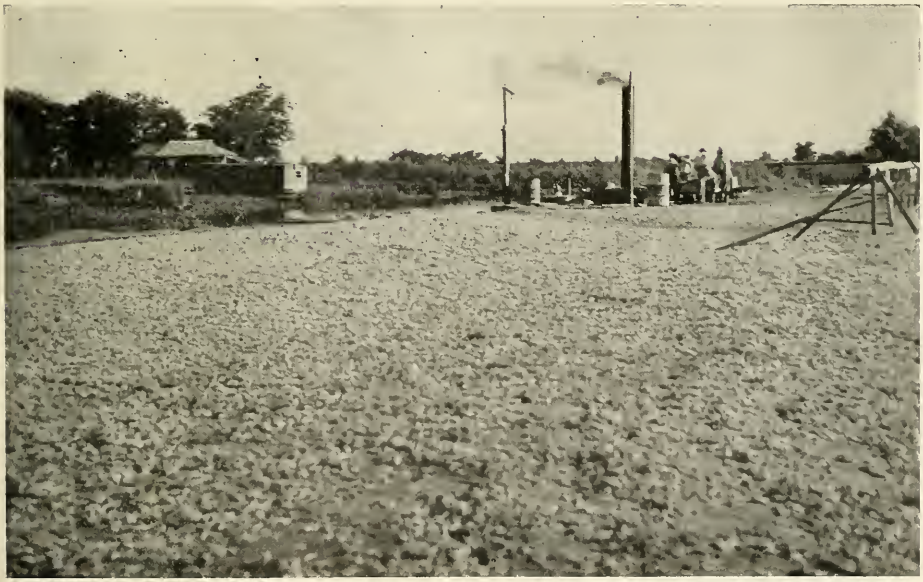
The majority of the Louisiana canneries are under direct supervision of the U. S. Food and Drug Administration, which maintains a corps of inspectors to examine the raw shrimp before they are peeled, to check the processing time and the sanitary conditions of the plant. The canners who subcribe to this inspection service are permitted to so label their packages in accordance with the provisions of the U. S. Food and Drug Administration.

Fish Oil Paints

By the newly developed process of hydrogenation fish oils, which formerly had only restricted uses in the arts, are now made into fats for human consumption and by partial oxidation, into drying oils for the manufacture of protective coverings and paints.

The Muskrat Carcass

The utilization of the carcasses of the millions of muskrats annually trapped in Louisiana presents a major problem in the conservation of valuable food material which will some day be solved to our material advantage.



A large batch of shrimp on a sun-drying platform.

One Reason Why Ducks Became Scarce

(EDITORIAL NOTE: The following paragraphs were extracted by Dr. Davis H. Thompson from the Sports periodical, THE AMERICAN FIELD. They appeared in that publication in the year 1886.)

"He who can walk through the game markets of Chicago and St. Louis and see the evidences of the terrible slaughter of the butchers of spring ducks and not feel outraged at the infamous, brutal, outrageous, damnable and wanton murder of the breeding birds is devoid of those attributes which are characteristic of men, and mark the distinction between man and the lowest of the * * * the following damnable evidence of the bloody slaughter, taken from the St. Louis *Republican* of Saturday last. And to think it is butchers' carnival:

" 'The state of the St. Louis duck market yesterday is as good proof as could possibly be asked for the absolute and immediate necessity for putting a stop to spring shooting. For two or three days previous the receipts of wild ducks had been so large that mallards were for sale at the ridiculously low price of $1.00 a dozen, but this figure was entirely eclipsed yesterday when heavy receipts and warm weather forced prices down, first to 75 and then to 50 cents a dozen. Four cents each for such bird as a mallard! For some days past no mallards that have reached this latitude have been fit for food. The drakes have been thin and worn, showing every sign of the breeding season, and the ducks have been in egg. None, or very few, of the mallards have arrived in flights, pairing having commenced long since down South. Every female that has been shot has been a loss to next year's duck crop of the total number of ducklings she could have hatched; and the case is just as bad where the drake is concerned, for he is monogamous and where he is killed his widow fails to raise her brood. Hundreds of bushels of spoiled flesh of the wild duck have been thrown away in the city this week, and our descendants will suffer severely for this wanton waste. We unfortunately have as yet no ordinance in Missouri against spring shooting, but there is a clearly cut law in Illinois against the use of swivel guns and night-shooting, and it is simply scandalous that the authorities of East St. Louis and Canteen Lake do not put a stop to these practices. For every duck killed by a swivel gun two are crippled, and as, for instance, one man brought 400 in from Canteen (Madison County, Illinois), as the result of one day's slaughter last week, it is easy to guess what the total waste amounts to'."

Careful Tree Planting

By
H. B. WEILAND, JR.

In offering this article on careful tree planting, I wish to say that I am writing it through experience and in the humble way in which I see it. Of course there are many who have many viewpoints, but I believe that every true nature lover will agree with me on this subject.

We are living in an age of planting. Nearly everyone is beautifying, even if it be on a very small scale. By far the greatest of this beautification is being done by the planting of trees. Our cities are sponsoring and aiding in tree-planting along the roads and highways, around public buildings, in parks and in private yards. Our own Louisiana has done probably more than any other State in the Union in carrying out this most important work. Louisiana has been giving trees and shrubs in aiding and carrying out this project. Our own United States has organized a Tree Planting Organization which is composed of patriotic citizens. If nothing unforeseen happens to these trees, it will be a more than glorious sight to motor along our beautiful highways in a few years.

Even with all this care, caution and protection, there have been those who have been very careless about tree-planting. There are many who do not understand how to plant a tree in regard to depth and position, but this is not the greatest mistake. By far the greatest error is that many people who are real tree lovers plant their trees too close to roads and buildings. Such persons do not realize the natural laws of a growing tree. There are many people who plant trees as if they did not expect them to grow. In fact, it does not make any difference if they live or not, because if they do live they will be too close together or too near a building, or too close to the roadside. We are living in a century when highway and road improvement is being done on every highway and on nearly all roads. This means that there should be a right-of-way of at least thirty-five feet on both sides of the road. A tree should be planted at least fifteen feet from the right-of-way if it is expected to be in a private yard or park and be given the sufficient space for it to attain its full growth and look well.

Of course, it makes a difference as to the kind of tree which you wish to plant. Some trees can grow and thrive to their natural beauty and size on a small space; for example, on small spots we often see full-grown palms, elms and some species of oak. On the other hand, a tree like a live oak or some other kind of tree that spreads its branches and grows to a great size would have to be planted on a larger spot. Such trees should be planted in places where their growth may be provided for in a natural way. A live oak planted three feet from a sidewalk is about as unreasonable as could be, yet this is just the way many of these trees are planted on the grounds of public buildings. If all nature loving citizens would consider space and size in planting, the work would not be in vain.

Louisiana's Timber Industry

by
V. H. SONDEREGGER

The two of the most important natural resources in the State of Louisiana are the minerals and the forest products. The mineral resources are mined and cannot be replaced. The forest products resources, with judicious management and proper supervision, cannot only be replaced, but can be made a continuous industrial activity and at the same time sustain large numbers of industrial workers on a permanent basis. Records show that the third and fourth generations are employed throughout the State of Louisiana in the forest products industry, and from the present indications of a continuous timber supply, many of these families will be continued in the forest products industrial activity.

The United States Department of Commerce has released the statistics for the year 1935 on the lumber industry in the State of Louisiana. This includes only lumber and timber products and does not include pulp and paper manufacture.

LOUISIANA LUMBER—1935

Number of Mills	173
Salaried Employees	988
Wage Earners	16,921
Salaries Paid	$ 1,985,520
Wages Paid	$ 9,150,335
Operating Expenses	$12,576,005
Value of Products	$31,628,469
Value of Refabrication	$19,052,464

Louisiana has held an enviable position as a leader in the lumber production of the United States. The Department of Conservation for the past fifteen years, through its Division of Forestry, has developed a large area of timber in the State of Louisiana through an intense fire protection campaign. At the present time it is estimated that two billion, one hundred million feet of timber is growing per year, and that but only one billion is being cut. At this rate, Louisiana's timber resources will continue to increase and will guarantee a constant production to the State.

However, a great deal will depend upon the cooperation of all forest products users and the State of Louisiana in avoiding the overdevelopment of forest products industries, which will consume more timber than is growing and leave the State in a condition where the timber may become exhausted by over-cutting. This is a problem that the citizens and the industries of the State must meet for a future program of timber conservation.

At present, Louisiana leads the nation in the production of hardwoods. It also leads in the manufacture of magnolia, red gum and tupelo. Herewith is a list of timber cut in the State and its rank, according to national production:

LOUISIANA TIMBER CUT—1935

	Bd. Ft.	Rank
Hardwoods	387,386,000	1
Pines	1,065,384,000	2
Ash	15,744,000	1
Basswood	29,000	21
Beech	5,384,000	9
Cotonwood	9,906,000	3
Elm	7,079,000	3
Hickory	2,390,000	3
Magnolia	9,538,000	1
Maple	1,840,000	21
Oak	128,265,000	3
Red Gum	116,603,000	1
Sycamore	1,516,000	5
Tupelo Gu	71,919,000	1
Walnut	12,000	19
Yellow Poplar	3,591,000	10
Miscellaneous	13,570,000	1
Cypress	54,066,000	2

It is of the utmost importance that citizens, the industry and the other allied agencies in the State of Louisiana cooperate with the Department of Conservation in developing the forest fire protection program, which assures a future of increased timber products. Timber cannot be reproduced if fires are permitted to burn over for years and destroy the young seedlings. Systematic cutting principles must be observed by the industry. Over-cutting must be eliminated, and all of the interests allied to the forest products industry must cooperate for not only the development, but also the protection of Louisiana's timber supplies.

Ester Gums

A new and interesting class of derivatives from rosin are now being prepared under the name of ester gums. These gums are largely used to advantage in the manufacture of varnishes and lacquers to replace copal, dammar and kauri gums which are getting scarce. The possibilities for large and profitable industries for making gums are very promising.

There is a new material called "oil reactive resin" to distinguish it from the "oil soluble" resins or the natural and synthetic ester gums. These consist of the phenolic resins mixed with rosin to promote solubility.

The "oil reactive" resin may be used alone or mixed with other varnish gums and ten per cent of this oil reactive resin in an ester gum varnish, reduces the drying time from over seven hours to three hours —besides giving extra durability.

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Woodflour

Wood flour is an excellent absorbent for nitroglycerin in the manufacture of dynamite, also as a filler for linoleum. It is also used to make the wallpaper known as "oatmeal" paper and enters into the composition of woodplastics for decorative purposes.

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Manufacture of Paper

The making of wood pulp originated in the United States and Americans invented most of the chemical processes for producing paper from wood as all paper, from its origin as a product of the papyrus plant, was made from crop plant fibres until fifty years ago. It has recently been shown that bleached or white pulp can successfully be made from Louisiana pines for the fabrication of book papers and this discovery will give great impetus to the growth of the paper industry of this state.

o

Wood for Cattlefood

An interesting possibility for the use of wostewood lies in the use of hydrolyzed woodmeal as a carbohydrate cattlefood.

Bayou home of Spanish moss picker.

The Spaniard's Beard Goes to Market

Negro picker's cabin, his garden, his pigs and chickens—and his black moss. An island of dry land in the swamp.

The "filling" of your next bed mattress, living room divan or automobile seat may be made of Spanish moss . . . A special survey of this picturesque Louisiana industry is now being made by the Forestry Division of the Department of Conservation, under the direction of V. H. Sonderegger . . . Some of its unique and colorful phases are presented in the following article.

Next time you are sitting on the old parlor sofa with your best girl take out your pen-knife and surreptitiously slit a hole in the sofa covering to see if its "innards" are horse hair or Tillendsia Usneoides (oh, well, Spanish moss).

Purely in the interest of science or of romance. If Tillandsia or Spanish moss should be disclosed to your inquiring eyes you may proceed to regale said b.g. with the romantic story of a Louisiana industry that is in many respects unique among the industries of the world.

Louisiana's natural resources, of infinite charm and variety, are derived from land and sea, and oft-times thereunder, but moss is one of its industries that thrives exclusively on air—and strange to say, like the stuff that press agents are paid for, it seems to thrive best on hot air or at any rate in the high temperatures of the Summer months.

No planting, no fertilizer, no cultivation—just a long pole with a hook on it and the agility of a monkey, that's what it takes to harvest one of Nature's most bountiful crops.

Tillandsia Usneoides

This air plant was named after Prof. Tillands, a Swedish botanist, and the specific name of usneoides was applied because it is "lichen-like." Imaginative writers have described Tillandsia as a sort of cob-web or witches' hair—and some of them have given their readers the impression that it is a parasite. The literary genius, Lafcadio Hearn, in his poem "Spanish Moss," pictures the long strands of Tillandsia as "vampires of the woods," existing on "spectral sap," even denouncing them as "vegetable thugs."

As to the origin of the more popular name of Spanish moss we are informed that when the early French settlers came to Louisiana they inquired of the Choctaws and other Indians the name of the strange growth that hung in long, gray festoons from the branches of the trees. The Indians replied that it was *itla-okla* or "tree hair." The Frenchmen relished a joke and immediately discovered a striking resemblance between the long strands of moss and the whiskers that embellished the visages of the Spanish explorers; they gravely advised the Indians that the correct name of the plant was Barbe Espagnol or "Spanish Beard."

The Spaniards retaliated by telling the Indians that the true name of the plant was Cabello Frances or "French Hair," in tribute to the long locks of Bienville's men; but the Indians seemed to think Barbe Espagnol the more appropriate designation; and as the French language gradually gave way to that of the

The negro moss picker homeward bound at the end of the day. Crude but efficient transportation.

English settlers the popular name for many years was "Spanish beard." It is only in recent years that it has been changed to Spanish moss.

The Family Bromaliaceae

A scientific study of Tillandsia was made some years ago by Frederick H. Billings, who reported that our so-called Spanish moss is the most representative specie of the tropical and sub-tropical family Bromaliaceae, related to the pineapple. It extends from southern Virginia, its northern limit, to the Argentine Republic.

Mr. Billings gives as an explanation of the popular belief in the parasitism of Tillandsia its preference for sunny exposures, which tends to keep it from trees having a dense shade. In dark forests it hangs suspended from the higher limbs of tall trees, especially those that are dead. Many a cultivated tree when in perfectly healthy condition possesses foliage too dense to serve as a host for Tillandsia, but if for some reason the supply of leaves should be reduced the light condition may be such as to make the presence of the moss epiphytic possible.

In order to demonstrate experimentally that moss can live solely on what it derives from air and rains, some festoons were supported by twine and hung from branches of a tree on which moss was already growing. As was expected the festoons produced normal flowers, gave rise to new growth, and at the end of eighteen months appeared to be as vigorous as any on the tree

though they came at no time in contact with it.

Spanish moss epiphyte is not usually propagated by seeds but by fragments of festoons. Being rather heavy these are not carried far except in a very high wind, or by birds, which in some regions utilize the plant in building their nests. This explains why certain trees of a given locality may be abundantly supplied while a tree a little distant from others bearing the moss may not receive its first detachment of the epiphyte.

The Water Supply

As in all epiphytes the source of water supply for Spanish moss is atmospheric precipitation. Dissolved in the water are the necessary salts which have been dissolved by rain from dust in the air. Probably an equally fruitful source of salts in many cases are washings from the tree, which in dry weather may accumulate much earthy material in the form of dust on its branches. The plant itself even serves in collecting dust, on account of its scaly surface, so that when wet the deposits beneath the scales yield a small amount of soluble material.

A most remarkable characteristic of moss is its ability to retain water. The absorption of water is accomplished over the entire surface of the living parts by means of scales, its retention being accomplished by the scales and also by the cuticularized epidermis.

Some festoons of moss were hung in a closed dry room for nineteen days without water. They lost 23 per cent in weight during this period, but when placed in water they absorbed as much as they had lost, and remained healthy plants, showing that they had not really suffered injury by exposure to the drouth. There is occasionally, of course, a similar drying process in the open air when drouth occurs; moss plants have been subjected to two months of rainless exposure without injury.

The commercial value of moss is derived from the mechanical tissue which forms a central cylindrical strand composed of reduced phloem and xylm, surrounded by a mass of thick-walled sclerenchyma fibers. When the parenchymatous cortex is removed, the sclerenchymatous axis remains as a tough elastic fiber. The curing process is a means of eliminating the parenchyma. One method largely employed is that of burying the moss in trenches or pits, allowing it to remain till the cortex is dead and in a condition to be easily removed.

An Old Industry

The Spanish moss industry, which is nearly as old as Louisiana itself, yields a revenue of 1½ to 3 million dollars yearly, subject to supply and demand, most of it going to the gin operators and pickers.

In the early days the settlers gathered the moss, cured and ginned it by hand, making braids from which they manufactured bridles, saddle blankets and horse collars. They also used it for pillows and bed mattresses; old residents of New Orleans will recall the custom of changing from feather pillows to moss pillows in the Summer, on the theory that the moss made a cooler headrest.

Nowadays it is the custom to pick the moss green from the trees, stack it in piles and soak it in water, permitting a gradual rot of the outer coating. When cured the moss is black in color and resembles horse hair. The cured moss is ginned, the threads separated; bark, twigs and other foreign material are removed. It is then baled in small bales and sold to the manufacturers.

Supply Seems Inexhaustible

Spanish moss is so prolific that there appears to be little danger of destroying the base of supply. As one travels through Louisiana one is impressed by the seemingly inexhaustible quantity of moss that festoons the cypress, live oak, tupelo and other trees of our swamps and flat woods, but there are certain factors that tend to restrict its commercialization. It would appear to be an easy undertaking to gather this moss from the trees, load it in a boat, cure it and sell it in the open market—but it is by no means as easy as it appears.

In the lazy days of the Summer months, when fishing is the favorite diversion of a large part of the native population, picking moss in southern Louisiana is the variant of cotton picking in other parts of Dixie. Before the sugar cane ripens, and the hunting and trapping season opens, it is the money crop of an appreciable proportion of those Louisianians, white and black, who inhabit the fringe of swamps, the banks of bayous and canals. Some-

. . . "has a different philosophy or attitude towards life than the urbanite . . ."

Modern highways bring the moss closer to market.

times you see a group of their cabins, a little colony of moss pickers with their own community life—sometimes you will run across a single thatched hut deep in some swamp jungle.

Few On "Relief"

Each little cabin is surrounded by its own garden patch, its corn and sugar-cane and potatoes, pigs and chickens, and with the cash that comes in from the moss the picker is fairly independent. Probably no class of workers in the United States had such a small percentage on relief during the depression—in fact, some of those swamp denizens off the beaten trail didn't find out about "relief" until it was practically over. Fishing in the Summer, hunting and trapping in the Winter, with occasional sallies to the "white folks" plantations for a few days' work seems to take care of their necessities—and luxuries are not even dreampt of, much less known.

The poorer whites and negroes might find moss picking an ideal existence if it were not for the curing process, which requires about two weeks. If Sambo could go out Friday and pick enough moss to put Saturday money in his jeans, that would indeed be the life of Riley—but to wait two weeks to harvest the fruits of his toil takes some of the ambition out of his system. At the rate of $2.25 the hundred pounds for ordinary cured moss it is not such a remunerative occupation; and if the boss man is inclined to be finicky about a little green moss or trash it isn't a pursuit to lose any sleep over for fear of competition—that is, as a picker.

Looking at one of those little cabins without screens—only burning smudges to keep away mosquitoes after night-fall—and watching a water moccasin as it glides along the edge of the bayou—one wonders if this primitive existence is conducive to a greater degree of true happiness and contentment than the rush and bustle of our city streets. Certainly the moss picker has a different philosophy or attitude towards life than the urbanite—having known none of the refining influences he appears to get along very well without them, a lackadaisical attitude that is not easily disturbed or excited by the stranger's approach.

Having gathered his moss the picker loads it in a pirogue or flatboat and brings it home, hanging it out in the sun for the curing process. With the coming of our concrete highways the marketing problem has been simplified—one of the city or town buyers will pass that way with his truck in a few days, making the rounds of the moss-picking settlements.

The Trading Post

In more remote parts of the country you will find commissary stores that run an account with the moss pickers throughout the year, advancing supplies against deliveries of moss. In most cases these moss pick-

V. H. Sonderegger inspects the product of this moss "farmer".

ers are also trappers, turning in muskrat, otter, raccoon, opossum and other pelts, as well as turtles, frogs and alligator hides, and getting credit with the store for flour and bacon and molasses and other supplies.

The Moss "Farmer"

A step-up in the social or economic order is what might be termed the moss farmer who gathers and cures a moss crop as one of his sources of farm income, along with his sugar-cane, corn, potatoes, cattle, hogs and chickens. These farmers are not to be classed with the moss pickers whose cabins are seen at the forks of bayous and canals—or the hermit who scuttles across the road like a wild animal, his beard hardly to be distinguished from the pack of gray and black moss on his back.

In checking up a family of five living in one of the hardwood bottoms it was found that 100,000 pounds of green moss had been sold by them the previous year, 20,000 pounds of cured moss; that they had received an average of 2½ cents a pound for the green moss, three cents for the cured.

The price of moss fluctuates to a considerable extent from season to season, depending on the hauling distance to market and other factors. The lowest grade of green moss generally brings 1¾ cents a pound; the second grade, 2½ cents; the third, 2¾ cents; and the top, three cents. Ginned moss has a variable sale price, depending on supply and demand; the average is about $9 the hundred pounds.

It is figured that the average moss picker can gather 500 pounds of moss a day; the gin has a capacity of 78,000 pounds of dry moss per diem, so that 156 moss pickers will be required to keep it going. From 15 to 30 men are employed by the gin, which operates 150 days of the year. The average wage of the gin worker is $1.50 to $2.00 a day.

A large percentage of Spanish moss is grown in the watered areas of the state, and the height of the moss picking season is usually dur-

Moss drying "on the fence" alongside the corn field

Moss is often called the "lagniappe" crop—no cultivation is required.

Moss "rotting" process in the field.

The ginner prepares the moss for the manufacturer.

ing the Fall and Winter months, beginning in November and lasting until April.

While moss picking may be considered an humble occupation, it has laid the foundation for many fortunes throughout southern Louisiana. Old-timers who started out as moss pickers fifty and sixty years ago, when virgin timber forests could be bought for very little, invested the returns from their moss picking in large tracts of timber that made some of them millionaires in later years.

In none of the natural resources of Louisiana does Nature demonstrate her remarkable fecundity in a more picturesque style than in providing the raw material for an extensive industry with no assistance whatsoever on the part of man.

Roadside Improvement

The Louisiana Highway Commission and the Federal Government are spending time and monies to make our highways pleasing in appearance as well as useful through their programs of Roadside Improvement.

T. Slack, state landscape engineer, says it is impossible to define the limits of benefit accruing to the public due to the increasing use of our improved highways, and likewise it is impossible to state the benefits of roadside improvement work. However, he adds that it is an established fact that improved roadsides are a benefit in many ways and certainly a large benefit to those localities in which such work is done. It is important that we maintain our highways to a high degree of excellence and make our roadsides worthy of the attention of the traveling public, both to ourselves and to the stranger within our gates. The creation of attractive roadsides has rebounded to the benefit of the communities and will continue to do so with the ultimate result that all Parishes and the State will be benefitted.

The job of doing this is no small task; in preserving what nature has already bestowed and adding to it with new plannings and settings, plus other features which go with it. It is not, in every respect, any one community job, any one Parish job, or any one Department job of the State, but it is a job which requires the help and work of every individual and organization at large in the State. It cannot be successfully done until enough sentiment has been built up among the people to help carry the work along which has already started.

Such work of improving roadsides is necessarily slow work but much progress has been made in Louisiana since the Commission included it in its program about four years ago. There are now seven Federal projects in the State located as follows: Port Allen to Livonia, Crowley, Jennings, Lecompte, Greenwood, West Monroe and Tallulah. Besides these the Commission has carried on its own program of planting trees and shrubs and doing other work to enhance the beauty of the roadside, such as selective thinning of native growth, backsloping, etc. Many of these projects are just now beginning to attract the attention of the public as it has required a few years, particularly the planting work, to "show up".

It is well to say that roadside improvement is not merely the planting of trees, but it includes other work, such as thinning out existing growth and saving the best trees, sodding, backsloping, creating better drainage and in general dressing-up the roadside—even keeping it clean —and therefore to do this it takes the public's help in many ways.

Some have not yet realized the value of trees and shrubs along the highways and have damaged or cut-down trees on our rights of way to further their own private or commercial interests, and in some cases, through pure vandalism. Others have deliberately dug-up and carted away trees and shrubs for their own private use. To those of you who drive our highways and are interested in your locality and State to desire our highways made and kept in a pleasing appearance, an appeal is made for your cooperation in reporting any person who violates our law with respect to the removal, destruction or damage of trees and other plants on the rights of way. In several States the motoring public already has this well in hand. It is discouraging and then expensive to have newly planted materials stolen or damaged, and it is more than discouraging to see large native trees cut down or disfigured when they could have been saved.

John D. Said It

Some years ago when John D. Rockefeller was asked the question, if the possibility of making large fortunes in the United States had passed with the more or less completed development of the natural products of the country replied, "that he did not believe that wealth made from exploiting natural resources could compare in greatness with the fortunes to be made in the future by the utilization of these resources from their conversion into manufactured articles of commerce by scientific treatment."

YELLOW MAGIC

Unloading Sulphur from Barge to Vat, Port Sulphur, La.

Independence in the United States was assured politically 161 years ago, when the founding fathers met in Philadelphia and drew up the now historic document that introduced a new nation.

The economic independence of the United States was assured millions of years before the Liberty Bell was tolled, when vast forces wrinkled the earth's surface and folded rich mineral deposits into the part of the globe that became these United States.

Oil, coal, iron, gas, sulphur and scores of other substances essential to modern agriculture and industry were literally crammed into the midriff of the new continent—making this the richest region in the world in raw materials. In order to convert the wealth of these natural resources into usable goods and power and light, scientists and engineers have learned to burrow and drill into the earth and to overcome poison gases and countless other obstacles that nature placed in their path.

When, in 1903, Dr. Herman Frasch solved the cunningly guarded secret of Louisiana's sulphur deposits, deep-hidden in the swampy bayou country along the Gulf coast, it is likely that not even he, noted scientist that he was, imagined the scope and manifold new uses to which sulphur would be put in the next brief quarter of a century.

Appearing as doctor, warrior, artist, priest, and in a dozen other guises, sulphur has held the center of the stage of world progress for nearly 4000 years. From the mystic temples of the Orient to the volcanoes of Sicily, the arsenals of Europe, and the scientific laboratories and factories of the United States, sulphur has been the warp and woof in the fabric of history.

In the new industrial empire of Louisiana a leading role will be played by sulphur, the "yellow magic" of industry . . . Its recovery from the bowels of the earth is a remarkable demonstration of the power of mind over matter—a tribute to modern commercial enterprise and engineering skill in the face of tremendous odds.

The yellow magic of sulphur probably dates from pre-historic times when cave-men stumbled on its wonders. In all likelihood, they found that they could shake off the effects of "spring fever" by eating sulphur. Undoubtedly they burned lamps of the yellow mineral to cast out evil spirits. Probably they even daubed the stone age equivalent of "Home Sweet Home" over the rocky entrances to their caves in yellow sulphur paint.

Sulphur In History

From ancient writings it has been learned that sulphur was used 2000 years before the Christian era by pagan priests in weird ceremonials. Its bright, almost ethereal, blue flame and pungent odor gave it an important role in temple sacrifices and purification rites. About the same time, but more practically, it was used as a bleaching agent for linen and cotton. Certain Egyptian paintings about 1600 B.C. clearly contain colors with a sulphur base.

Sulphur made its way even into the Odyssey. Homer tells how Odys-

Plant and Field Lay-out, Grande Ecaille, Louisiana.

seus, after slaying his wife's suitors, burned sulphur to cleanse the air of evil and purify his house. Thus was sulphur used as a fumigant in 1000 B.C.

Five hundred years later came a discovery that eventually sounded the knell of the knight in armor, of the English bowmen and their cloth-yard arrows. It was the manufacture of the first gunpower, out of sulphur and other substances, by the Chinese during the time of Confucius.

As far back as the Middle Ages it was used in the manufacture of artificial jewelry, imparting a golden sheen to ornaments. Alchemists struggled to convert baser metals into gold by means of it, and its inflammable nature and pungent odor when burned puzzled students of early physics.

The first commercial sulphur came from Sicily, the mountainous little island off the toe of Italy, early in the 15th century. But it wasn't until 1735, when a process for the manufacture of sulphuric acid was developed, that the nations of the world began to vie for the control of the element.

In 1869, the first sulphur deposit in the United States was discovered in Calcasieu Parish, Louisiana. Prospectors searching for oil along the Texas coast discovered sulphur in that state sometime later. Thus, in Louisiana began America's struggle to produce this element at costs which would enable agriculture, industry and science to enjoy to the full its manifold benefits.

Today, while it is true that about three-fourths of the world's supply of one form of sulphur—namely brimstone, comes from the Gulf states region, the United States' sulphur supplies compete in the world market with sulphur recovered from pyrites, from smelting operations and other sources. As a matter of fact, we produce less than one-third of the world supply, and this in the teeth of bitter competition from other important sulphur-producing nations, chiefly Italy, Japan, Spain, Germany, Chile, Norway, Finland, Australia, Portugal, Sweden, Greece and Russia.

America's Supply

But unlike the sulphur deposits in other countries, America's supply of the magical element is found in locations almost inaccessible to man, as we in Louisiana well know.

Problems so baffling that they seemed almost insurmountable confronted engineers of the Freeport Sulphur Company when they began operations at Grande Ecaille, in Plaquemines Parish, in 1932. At this mine alone, $4,000,000 was invested before it could be definitely ascertained that sulphur could be produced in commercial quantities. Indeed so varied and serious were the problems encountered here due to the marshy surface and the porous sulphur-bearing limestone, that it is safe to say that had Dr. Frasch undertaken his original work at Grande Ecaille, almost certainly the basic method which makes possible the Louisiana sulphur industry would never have been proven workable. By the time Freeport engineers undertook to employ the Frasch method at Grande Ecaille they at least had the knowledge that the method itself would work, to encourage them in developing special solutions such as the costly mudding operation, which will be described later. Fortunately for Dr.

Belt Conveyor at Vat Site.

Frasch and the peoples of the world who are provided sulphur through his genius, his important experiments were conducted at the one dome which offered the most satisfactory conditions for the application of a hot water mining method.

Engineers engaged in prospecting operations at Grande Ecaille were hampered by the fact that the terrain of the region is so soft that virtually no equipment could be used unless floated on barges or supported by piling. Rank salt grasses form a mat on the surface, from a few inches to several feet in thickness, and this mat floats on a layer of ooze composed of fine sand and sediment. Tests showed that soft clay lies beneath the ooze, and that the sulphur-bearing limestone rock is several hundred feet below the surface.

A Gigantic Task

As soon as the prospecting operations definitely established the presence of sulphur in commercial quantities, engineers began the gigantic task of constructing the plant. Working waist-deep in the muck and swamp, they fought to build a foundation capable of supporting the heavy mining equipment and the homes and other buildings for a model town to house the employees of the company.

By the time the work had been completed, 35,854 piles had been driven into the boggy delta land. So soft was the terrain that the piles sank to a depth of 45 feet by their own weight, and piling up to 90 feet in length had to be used. It was estimated that if all the piles were laid end to end, they would reach from New Orleans to Houston, Texas.

In order to form a foundation which would support the immense weight of the plant and building, totaling 271,787 tons, it was found necessary to construct a reinforced concrete mat on top of the piling. All together, 9,603 cubic yards of concrete were poured, weighing 19,206 tons.

Approximately 4,000,000 board feet of lumber were used in the initial construction project, and several hundred thousand board feet of lumber are now being used every year in the operations at the mine.

Nearly 40 miles of pipe lines were laid to assure a supply of fresh water sufficient to carry on the continuous operations at the mine, and 30 miles of power and telephone lines were strung in the vicinity.

To provide adequate transportation facilities between the plant and the Mississippi River, 10 miles away, a canal 100 feet wide and nine feet deep was dredged. This operation alone entailed the removal of 2,000,000 cubic yards of earth, and an additional 2,000,000 cubic yards of mud were pumped into the operating area to raise the level above that of the surrounding swamps.

The Frasch Process

Even with the most modern equipment and engineering methods, mining for sulphur is no easy matter, for Nature has sealed the sulphur deposits beneath hundreds of feet of marshy soil. Twelve years of painstaking struggle and experimentation went into the problem of recovery of sulphur under these adverse conditions before Dr. Herman Frasch solved the riddle with what is known as the Frasch process. Basically, this process is the melting of the sulphur

Aerial View of Vat Site, Field Operaions, Grande Ecaille, La.

with hot water deep in its underground bed and pumping the liquid to the surface where it cools and hardens.

But the operation isn't as simple as it sounds. The water must be heated to a temperature of 320 to 350 degrees to melt the deep-lying sulphur so that it will flow out of the crevices in the limestone in which it is embedded. And in one 24-hour period of a typical sulphur mining operation, more than 3,000,000 gallons of water are used to keep four to seven wells, spread over a comparatively small area, constantly "steaming". Several man-made reservoirs supply the fresh water that is needed. Gulf water can't be used because of the corrosive action of brine on the pipes and pumps.

Obviously, 3,000,000 gallons of water cannot be heated on a cookstove, and not even a cupful of it will rise much above the boiling point of 212 degrees in a teakettle. So a tremendous battery of pressure boilers and water heaters was installed to do this job. They are fired by natural gas, using an average of 7,000,000 cubic feet a day.

These plants are in operation 24 hours a day, seven days a week, week in and week out. The reason for this is the fact that should the already molten sulphur in the pipes cool, it would solidify, and the well would be lost.

From the heating plant the water is piped approximately a mile to the wells. Sulphur is returned to the vats in a pipe that not only has a steamjacket around it, but also has a steam line through the core.

To the casual observer, the wells look like oil wells. But appearances are deceiving. Each well consists of four concentric pipes, the outer one being, in fact, a casing. Down the next to the outside pipe goes the water. It is forced to the perforated bottom of the casing, about 1500 feet down.

From the well-hole the water spreads through the sulphur-bearing rock, melting the element. The sulphur, being heavier, sinks to the bottom of the well-hole, from whence, with carefully regulated air pressure coming down through the innermost pipe, it is pumped up through the next to the center pipe, being kept hot en route to the surface by the fresh hot water continually flowing down in the pipe around it.

At the ground level, the pipes from all the working wells pour their liquid sulphur into a heated tank, and from there another line, heated inside and out with live steam lines, runs some distance away to a vat where the sulphur cools and hardens into a gleaming yellow "mountain".

When it is to be shipped, blasting powder breaks up the solidified sulphur, and steamshovels load the broken fragments on a conveyor belt which transports them to barges that are hauled ten miles to the shipping docks.

The "Mudding" Operation

Many technical problems have been conquered in this form of sulphur mining. One of the most spectacular achievements is the "mudding" operation, conceived and employed chiefly in our own state of Louisiana. This fantastic practice was developed by engineers of the Freeport Sulphur Company to make possible the production of sulphur from this property by combatting

Aerial View of Townsite, Canal, Loading Equipment, Port Sulphur, La.

Loading Sulphur on Barge, Grande Ecaille, Louisiana.

the loss of super-heated water through subterranean channels or "alleys" in the cap rock.

After much experimentation, the Freeport experts found that mud—millions of tons of it—was the best material for barricading these subterranean alleys. So, in addition to the hot water, an average of 7,000 cubic yards of mud are pumped into the wells every day.

This operation, one of the most costly and difficult in modern mining practice, is an outstanding example of the methods which have been evolved by engineers after the expenditure of millions of dollars and after years of intensive effort, so that Louisiana will be able to put the boon of sulphur at the disposal of our own people, and those in other states and countries.

The most important role in which sulphur plays a part is that of an invaluable ally of the farmers—for without it, they would suffer losses of millions of dollars annually from the ravages of insect pests and from plant starvation.

Fertilizer alone consumes 20 per cent of all the sulphur produced in America. Soils deficient in sulphur will not support normal plant growth, and such deficiencies can be met only by adding sulphur to the soil, either alone or in fertilizer mixtures. Fortunately for the farmer, most fertilizer mixtures contain sufficient sulphur to meet these requirements—one ton of the average mixed fertilizer containing about 100 pounds of sulphur.

Sulphur and Cotton

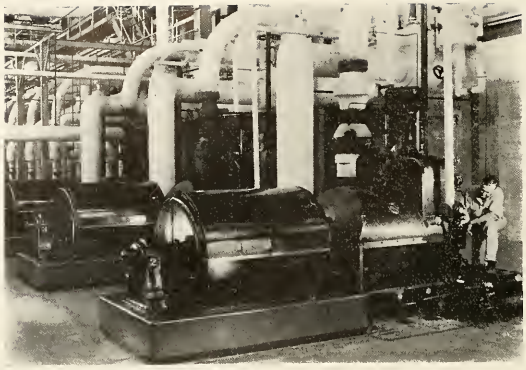
Today sulphur is playing an important part in fine cotton production, vital in the life of Louisiana. A few years ago, it was discovered that cotton seed, delinted with sulphuric acid, is easier to plant, germinates more rapidly and produces healthier, stronger cotton plants.

Another usage of sulphur in connection with cotton is in the eradication of the flea hopper, which annually destroys thousands of acres of growing cotton plants. By dusting the plants with sulphur the flea hopper's depredations are stopped. By this treatment, the cotton yield in several areas has been increased as much as 361 pounds of seed cotton per acre, with a consequent financial gain to the planter.

But cotton does not enjoy alone the bounties of sulphur. To the barley, oats, rye and wheat growers of the West, there are no greater enemies than such devastating weeds as mustard, wild radish, ragweed and Russian thistle. Of approximately 1,500,000 acres of grain grown in California last year, nearly 50 per cent were infested with these weeds.

Here again sulphur demonstrates its age-old magic. Infested California fields sprayed with sulphuric acid yielded from 50 per cent to 80 per cent more grain than unsprayed fields. The sulphuric acid kills the weeds but leaves the crop unharmed and free to flourish without the stultifying weed competition.

In the orchard regions, the citrus, apple, peach, cherry and other fruit trees are protected from attack by devastating parasites with sulphur



Interior of Plant, Grande Ecaille, La.

sprays and dusts. The garden rose bushes of Mrs. America are likewise protected by this cheap but highly effective fungicide and insecticide.

Sulphur is a respected friend of poultry farmers. For years it has been used in the control of lice, mites and chiggers. More recently its value has been indicated for the control of coccidiosis, a parasitic disease causing great losses among chickens.

Indispensable To Industry

This same wonder-worker, which is so active in helping the planter and farmer to great prosperity, is an absolute essential in practically all forms of industry.

The dependence of industry on the "yellow magic" of sulphur is amply illustrated by the fact that in 1936 the factories, mills and refineries of the nation consumed 7,620,000 tons of sulphuric acid—the form in which most of the mineral is used. Petroleum refineries alone accounted for 1,100,000 tons of sulphuric acid, and chemical industries required 985,000 tons.

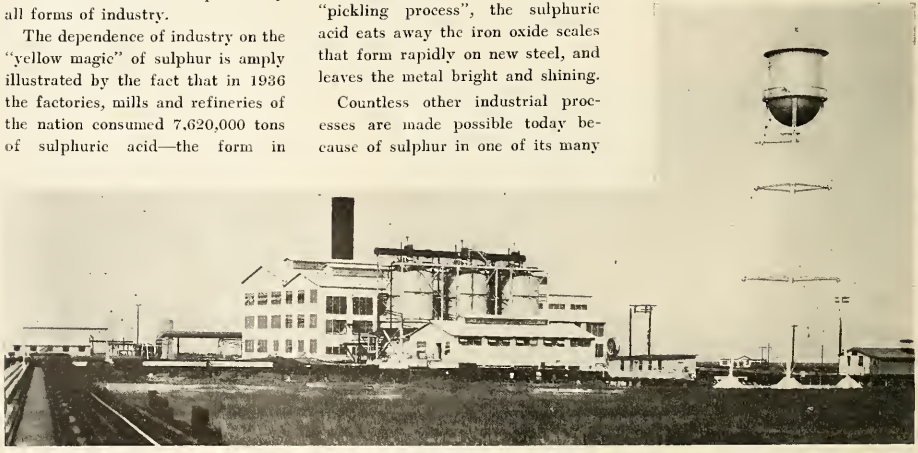
The iron and steel industry, which makes possible our great bridges and skyscrapers, our railroads, ships and autos, leans heavily upon sulphur, and annually uses approximately 700,000 tons of sulphuric acid. In the steel industry, sulphuric acid performs one of its most unusual tasks—that of "washing" the redhot sheets of newly formed metal as they come from the rolling mills. In an operation known as the "pickling process", the sulphuric acid eats away the iron oxide scales that form rapidly on new steel, and leaves the metal bright and shining.

Countless other industrial processes are made possible today because of sulphur in one of its many guises, and if it were not for this vital raw material, we would have no movies to watch, no automobiles, no rubber goods, no fireworks, glass, rayon or any of the thousands of products which depend at some stage in their production on sulphur.

The newspapers we read, the stationery we write on, the tissue paper around our Christmas presents—all these require the use of sulphur in their manufacture. In fact, the paper and pulp industry accounts for about 16 per cent of our total sulphur consumption.

With sulphur such a vital necessity in industry, business leaders are known to be considering the establishment of factories and mills in Louisiana, where they will be assured of adequate supplies of the yellow mineral. In addition, there is a growing appreciation on the part of industrialists of the fact that Gulf ports provide convenient points of distribution to South and Central America.

Such advantages, coupled with Louisiana's forward-looking ten-year industrial tax exemption program, point to a new era in which a balance between industry and agriculture will bring prosperity to our people and assure the state a place of growing importance in national and world affairs.



Power Plant, Grande Ecaille, La.

Law and Sporting Practices in Relation to Wildlife Conservation

By LAWRENCE J. MEROVKA

It is often said that we do not properly appreciate many of the things that contribute to the enjoyment of our lives until after they are gone. This is indeed true, and particularly so with reference to our wildlife resources. The writer has in numerous instances witnessed the utter destruction of fine hunting and fishing areas by unwise and unnecessary drainage projects, and although in some few instances individuals registered vigorous protest, usually it was not until after irreparable damage had been done that committees of sportsmen came forward in an attempt to reclaim the valuable heritage they had lost. After losing millions of acres of our finest hunting and fishing areas through drainage we have come to realize that we lost something of incalculable value, and oh, how we wish we could get it back. Some of it can be restored, and some presently is being restored, but the greater part of it cannot be reclaimed and this should serve as an object lesson to us to protect from despoilation what we still have left.

Although drainage of valuable wildlife habitat spells utter disaster for aquatic forms of wildlife frequenting the areas affected, there are likewise many methods effective in taking game and fish that if permitted to be practiced soon cause serious depletion. For this reason our Federal and State Governments have wisely enacted laws and regulations establishing open and closed seasons, bag limits, legal and illegal methods of hunting and fishing, and various other restrictions calculated to insure perpetuation of our valuable forms of wildlife. Federal and State conservation officials have for years sought to educate the public to the necessity of sane conservation laws based on biological facts and other pertinent considerations, and yet today there are still many people who object strenuously to such laws and condemn them as onerous, unnecessary, and an undue restraint upon their personal liberties. A typical case of disregard for sensible conservation practices came to my attention some years ago along a beautiful mountain stream. As is well known to anyone who has studied spawning habits of the small-mouth black bass, these fine game fish usually select as a spawning bed an area covered by stones or gravel, and from the stones or gravel the male fish sweeps away with his tail all mud and silt over an area usually from two to four feet in diameter, and in this spawning nest or bed the female deposits her eggs. These eggs are then guarded by the male fish until hatched, and for some time afterward he guards the young fish or fry. These spawning nests are very conspicuous in the sparkling, clear water of a mountain stream in contrast to the mud and silt covered areas surrounding them, and are therefore easily located. While guarding these nests the male fish will strike at most any lure cast in the vicinity of the nest. On this particular occasion I came upon a mountaineer fishing and in possession of several beautiful small-mouth black bass. During the course of a conversation with him he nonchalantly informed me that he had caught these fish at spawning beds, and when I remonstrated with him and sought to show him the error of his ways and the great destruction he had wrought he simply drawled "waal if I don't ketch 'em now the city fellers will get 'em this summer". Usually a good stiff fine or a jail sentence is the best way to correct such destructive practices when prohibited by law, and most States do prohibit the taking of game fish during the spawning season. People who commit such depredations are usually ignorant and definitely prejudiced against conservation laws, and their attitude is well reflected by a statement once made to me by a man I had arrested for killing game birds during the month of April when he said "the Lord put these birds here for us to kill and eat and you ain't got no right to arrest me for doing it". Now right there was a golden opportunity for me to preach the gospel of conservation and I didn't pass up the opportunity. When I got through talking

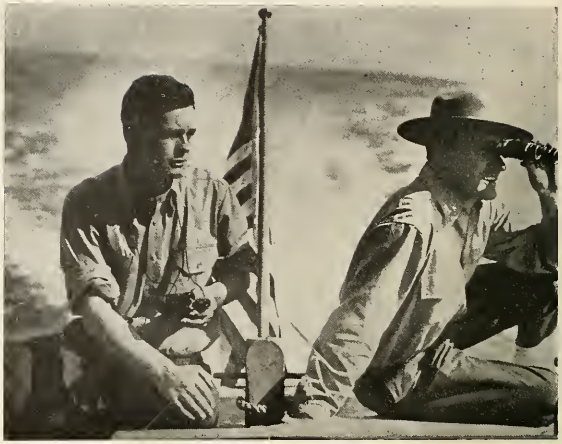
Merovka makes a nice catch of green trout in Vermilion parish—and observes the Conservation Department's "limit".

to this fellow he grudgingly conceded that "maybe I was right" but when I left him I had a feeling that I really had not changed his views. It was a case of "convince a man against his will and he'll be of the same opinion still".

Killing of Females

Because some of our game birds and mammals are polygamous and the males can readily be distinguished from the females at a considerable distance, it has been found practical and necessary for sustained high production to prohibit the killing of females, and such management has been found particularly successful in the conservation of deer and wild turkeys. Yet knowing that such management insures higher production and consequently better hunting, there are many men who will not hesitate to kill a doe deer or turkey hen on sight, and such people do not deserve the respect of good sportsmen or the sympathy of any Court before which they may be brought for punishment.

There is no bird that is held in higher esteem by sportsmen than our clever and beautiful bobwhite quail, and none furnishes finer sport. A hunter in the field with a brace of beautiful pointers or setters is an inspiring sight, and the behavior of the dogs while trailing, pointing, and retrieving is truly a thing of beauty. In areas where there are ample food and cover to sustain a good population of bobwhites, any sharp decline in their numbers can usually be traced to over-shooting or illegal trapping. Most quail hunters frequent the same coverts year after year and upon them rests the responsibility for maintenance of sufficient brood stock to replenish the coverts for the succeeding season. Game laws affecting this species usually stipulate the period during which the birds may be legally taken and the numbers that may be taken daily and seasonally, and prohibit their trapping and sale. Beyond this it is up to the sportsmen to perpetuate the species by ethical gunning practices. Killing quail on the ground is intensely disapproved of by any sportsman worthy of the name, but



Roy Moore, regional director, and Lawrence J. Merovka, U. S. Game Management Director for Louisiana.

a practice equally as destructive but all too prevalent is that of following up a covey of dispersed birds and killing them off until no more can be found. After four or five birds are killed from a covey a good sportsman will move on and look for another. Likewise when he flushes a covey of only four or five birds a good sportsman will pass them up and leave them for a breeding nucleus. When it becomes apparent that the birds in any given area have been killed off to the extent that further shooting will not leave sufficient brood stock, shooting there should cease for the season and the land owner appraised of the situation and requested to prohibit further shooting. Being an ardent quail hunter I have found that land owners are usually glad to cooperate in this respect. I have shot quail season after season on areas so managed and have found it very effective in maintaining a good quail population. Sportsmen should practice self restraint and remember that they will want to come back again next season and enjoy good hunting.

Wild Turkey

The majestic wild turkey is a bird that comparatively few sportsmen are familiar with because of it's extermination in much of it's former range. The writer has hunted and killed a few wild turkeys, and from personal observation and information obtained from turkey hunters of his acquaintance, is of the opinion that this fine game bird can be restored in areas where there is suitable habitat, provided any restoration program sponsored by conservation officials receives proper support from interested sportsmen to the end that human depredation may not seriously interfere with propagation efforts. Harold L. Blakey, of the U. S. Bureau of Biological Survey, in an interesting report on his observations and studies of the wild turkey on the Missouri Ozark range, says: "Man is the greatest factor limiting the turkey population in Missouri. The midsummer illegal kill, during the first 90 days of the new broods' life, is the worst. On one research area comprising seven townships, whole flocks of turkeys were wiped out and more than 50 percent of other flocks were killed, all within the 31 days of August, 1936. On this area, nine hens produced 99 poults that lived to more than 12 weeks of age. Three hens (33 1/3 percent of the brood stock) and 61 pounds (62 per cent of the offspring) were killed during the first 90 days of the summer growing season. In the face of such mortal-

ity there is little hope of stabilizing the turkey population, not to mention effecting an increase, by any wild turkey management practices that can be applied".

Punishment Necessary

Such a statement is probably a revelation to many persons who wonder why our wild turkeys have been exterminated in many areas or fail to show any increase in places where there are still a few flocks left. The remoteness of the areas usually frequented by wild turkeys and the manner in which these birds are hunted make it very difficult for game wardens to apprehend those who kill them illegally, therefore it is absolutely essential that conservation officials have the wholehearted support of sportsmen and the Courts in dealing with such violators when they are apprehended. Severe punishment is necessary in dealing with such cases to serve as a warning to others who might be disposed to violate the law.

The hunting of waterfowl from fast motorboats is a very effective means of taking such birds and has long been prohibited by law. When harassed by hunters waterfowl seek the sanctuary afforded by large, open bodies of water, for here they are comparatively safe from molestation by law-abiding hunters. A hunter lying down in a small sneak boat or scull boat propelled from the rear by a single oar can sometimes by skillful maneuvering approach close enough to such birds to make a kill, but it is the fast motorboat that constitutes their most serious hazard. The birds seemingly are unable to realize their proximity to a fast approaching motorboat and before they comprehend their danger guns are booming and several of their number are brought to bag. Ducks that habitually frequent open waters, such as canvasbacks, redheads, scaups, and ring-necks are more easily killed from motorboats than such species as mallards, pintails, teal, and widgeon. For one thing the latter spring from the water much faster than the other species mentioned and in addition are more easily frightened by the approach of a motorboat. Motorboats are also sometimes used in rallying and stirring up waterfowl in open waters to improve the shooting of hunters stationed in nearby blinds, and this practice is also wisely prohibited, for otherwise the birds would be constantly harassed by hunters and consequently killed in greater numbers.

A very meritorious regulation long sought by conservationists was adopted by the United States Government in 1935 limiting the capacity of shotguns used in hunting migratory game birds to not more than three shells at one loading. Since then a number of States have adopted similar regulations applicable both to migratory and resident game. In addition to reducing excessive slaughter of game this regulation is especially meritorious in materially reducing game wastage resulting from crippling. Many hunters will shoot at game until all their loads are expended, and with guns having a capacity of as many as seven shells this invariably results in the crippling of birds that have flown beyond effective killing range. A large percentage of such crippled birds are never retrieved, and although some of them may recover from their wounds, a greater number of them die from gangrene and other infections or are caught and devoured by predatory birds and mammals. Before the three-shot limitation on shotguns was put into effect it was estimated by competent observers that for every two ducks killed and brought to bag at least one bird was crippled and probably lost. Such wastage of game is tremendous when it is considered that millions of wild ducks are annually brought to bag. Our supply of birds is far too small to permit of such wastage and sportsmen should make every effort to retrieve crippled birds and also refrain from shooting at birds that are beyond effective killing range.

Pot Hunting

An offense against conservation laws that merits special attention of game law enforcement officers is that of pot hunting, or hunting game for the purpose of sale. A pot hunter has no regard for seasons, bag limits, or ethical sporting practices, and will quickly exterminate the game in the area of his operations. Shooting into fowl massed on the water and into covies of quail on the ground is one of his favorite methods of obtaining large quantities of game quickly and cheaply and attests to his utterly despicable nature. Two pot hunters, who later were arrested and jailed for their unlawful depredations, once boastfully told the writer that they had killed 56 blue and snow geese with seven shots by crawling upon a great mass of feeding birds at night. Much larger kills than this are made when several guns are fired simultaneously into large concentrations of ducks. As further evidence of the unconscionable conduct of pot hunters the writer once found several mottled ducks that had been killed and left in the marsh to rot. Upon examining these birds they were found to be in an emaciated condition and much down had been plucked from the breast—mute evidence of the fact that these birds had been nesting at the time they were killed as when nesting they pluck down from their breasts with which to line their nests. Later it was learned that the pot hunters that had killed these birds threw them away because of their emaciated condition which resulted from curtailment of their normal feeding habits while incubating their eggs. Mottled ducks nest in southern coastal marshes where they are commonly known as summer mallards and summer black ducks and are now protected by Federal law as a result of the recent Treaty between the United States and Mexico for the protection of migratory birds. When the pot hunter finds that it is unsafe to obtain game by shooting it because of the attention that is attracted by shot reports he will frequently resort to the use of traps and nets. He is indeed a despicable character, too lazy and shiftless to seek honest employment, and whenever one is found operating in a community he should be reported to conservation authorities immediately. Our courts usually deal harshly with such offenders,

(Turn to Page 62)

Fig. 1. Louisiana palmetto (SABAL LOUISIANA).

What Palms Grow in Louisiana?

by MIRIAM L. BOMHARD[1]

Fig. 2. Mexican Washingtonia (WASHINGTONIA ROBUSTA).

Palms are most abundant in tropical regions; their presence outside of the Tropics indicates a warm, mild climate. The very fact that palms grow out-of-doors, either wild or in cultivation, from California to Florida and North Carolina, is one of the greatest contributing factors toward recommending this portion of the United States as a winter resort. People who have lived in a palm-growing region all their lives cannot possibly appreciate the tremendous thrill the northerner experiences upon seeing palms for the first time, for palms are a symbol of tropical luxuriance. The person who is escaping snows, blizzards, and freezing temperature by "going South for the winter" knows he has arrived when he catches a glimpse of the first palm. Many city planning commissions have been aware of this for years and have planted palms extensively; others have apparently not yet realized that palms are a definite asset to any community in which they can be grown.

The palm family includes well over 1,500 species. Some 10 genera, embracing 16 species, are native to the United States, and, in addition, the coconut (*Cocos nucifera*) and the edible date palm (*Phoenix dactylifera*) have become practically naturalized. This representation is large, comparatively speaking, inasmuch as the southern tip of Florida is the only section of our country that has an essentially tropical climate. Two, perhaps three, species grow naturally in Louisiana, but they are not confined to this State alone. Of these, the Louisiana palmetto (*Sabal louisiana*), locally known as *latanier* or swamp palmetto, finds its center of distribution along the bayous and rivers in the southern part of the State (Fig. 1).

Fig. 3. Canary Island date palm (PHOENIX CANARIENSIS).

A detailed survey of the palms occurring in Louisiana shows that 26 or more species and a number of varieties and hybrid forms may be seen growing in the open at the present time. Our native species are not cultivated to any extent—the palms on our avenues and in our gardens have been introduced from other parts of the United States or of the world. The Washingtonias (*Washingtonia* spp.) (Fig. 2) and the various date palms (*Phoenix* spp.) (Fig. 3) are planted in much greater numbers than any other kinds. There is also a fairly large showing of palmettos (*Sabal* spp.), the windmill palm (*Trachycarpus fortunei*), and the Mediterranean fan palm (*Chamaerops humilis*). Plantings of the various types of *Butia* have become

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Fig. 4. Trunk detail. (Left) The boots split, forming a latticework —SABAL EXUL.

(Right) The boots do not split — BUTIA CAPITATA. The sheathscars are prominent.

more frequent in recent years. Several kinds of palms are represented in Louisiana by only a few individuals. Of these, the Puerto Rican hat palm (*Sabal causiarum*) is particularly deserving of more recognition —it is undoubtedly the handsomest of all the palmettos.

A Mild Climate

The extensive expanses of water in southern Louisiana make for a mild, almost insular, climate; this region is, therefore, naturally well adapted to the successful cultivation of palms. Except for two species, all the kinds of palms grown anywhere else in our State may be seen in New Orleans; Lake Charles also has a considerable number, but there are fewer species. However, the tropical effect created by the presence of palms does not depend upon a great variety of species. Monroe, in northeastern Louisiana, is a striking example of what can be accomplished with an extensive planting of a few very hardy kinds of palms.

It is important to know whether a particular species will survive a sudden freeze or occasional cold winters—the palms on the Capitol Grounds at Baton Rouge are all cold-resistant and will probably not have to be replaced for many years. It is also well to know the characteristic growth-habit of the different types and their suitability for planting in a given place. In Franklin, for example, a rather narrow neutral ground is set out with the Mediterranean fan palm, now about 8 feet in height. This species, with its slender, slow-growing trunk bearing a rather compact crown of small, fanlike leaves, is admirably suited to such a situation. The rate of growth of a species should be carefully considered, even to the extent of visualizing just what the palm will look like and where the crown will be, for instance, ten years after planting.

There is a sufficient assortment of hardy and semi-hardy palms—

Fig. 4. Trunk detail. (Left) Diamond-shaped leafscars; also sheathscars — PHOENIX CANARIENSIS.

(Right) Leafscar rings and fibrous remains of boots — TRACHYCARPUS FORTUNEI.

low-growing or tall, feather-leaved or fan-leaved—to satisfy most landscaping requirements. Some palms are delicate and graceful in their effect, others bold or majestic; some are wholly satisfying as solitary specimens, others are more pleasing in groups or rows. A confused collection of palms may lend a tropical atmosphere and be of interest because of the diversity of species, but it scarcely shows good judgment or a thorough appreciation of the planting possibilities.

The Queen Palm

Neither the royal palms *(Roystonea* spp.) nor the coconut palm—handsome, feather-leaved, tropical trees—can be reared successfully even in the latitude of New Orleans. To be sure, they have survived a succession of mild winters, but it is hardly worth the money and effort expended to continue introducing them. However, the beautiful queen palm, *Arecastrum romanzoffianum* (more familiarly known as *Cocos plumosa),* is more cold-resistant than the royals or the coconut. A well-protected plant grew for years in New Orleans, but finally died. At present, only one fairly tall specimen is thriving in Louisiana—near Venice, in the orange-growing country. This species would seem to deserve further trial. There are a number of palms of cool, subtropical habitat which would, no doubt, thrive here, but which have not, as yet, been tested.

Fig. 5 (a). Fan-leaved (WASHINGTONIA FILIFERA).

Fig. 5 (b). Feather-leaved (PHOENIX CANARIENSIS).

The beauty and ornamental value of palms is universally recognized; that they are an extremely useful plant family is not so generally known. As a matter of fact, more people the world over are dependent upon palms for food, shelter, clothing, and, frequently, a livelihood, than on any other group of plants, with the single exception of the grass family. Besides providing many of the necessities of life to native populations, palms contribute materials which enter into the preparation or manufacture of various products of importance to the civilized world, such as hats, ropes, crates, bags, buttons, soaps, varnishes, charcoal, furniture, and floor coverings. Palms produce a variety of raw materials, including fibers, sugars, starches, oils, fats, wax, and alcohol. The widely distributed coconut palm is considered to be perhaps the most useful species of all, although the edible date palm and the African oil palm *(Elaeis guineensis)* rival it in economic importance.

Commercial Uses

In the southeastern United States, some native palms were employed to a considerable extent in the past, and, even today, they are used for pilings, timbers, posts, brushes, tanning extract, etc. In 1896, a factory in Jacksonville, Florida, is reported to have used 7,500 trees of the Carolina, or cabbage, palmetto *(Sabal palmetto)* weekly in the manufacture of brushes. The fruits of a number of wild species were an important aboriginal food. The fruits of the saw palmetto *(Serenoa repens)* are used in medicine and listed as official in the latest edition of the Dispensatory of the United States.

It is believed that a brief outline of the general characteristics of the trunk, leaves, flowers, and fruits of the palm family as represented in Louisiana will not only give a better understanding of palms as a whole, but will also provide a background for the discussions of the Louisiana genera and species, which follow in this series of articles.

Palms usually have a single, unbranched, woody trunk topped by

Fig. 6. Carolina palmetto (SABAL PALMETTO).

an often massive crown of fan-shaped or featherlike leaves. In Louisiana may be seen examples of other growth-forms, such as cluster palms with several trunks and bushy specimens with a short, erect stem or a horizontal, underground stem. Many interesting types; *e. g.*, the Egyptian Doum-palm with the trunk branched like a tree, huge vines which clamber over other jungle vegetation, or palms with creeping stems bearing immense leaves which appear to come directly from the ground, do not exist in our region.

Since palms belong to that class of plants known as Monocotyledons, their trunk growth is quite unlike that of familiar timber trees, which form true wood and bark and in which the diameter increases from year to year. The stem of a palm is of fairly uniform thickness, since it grows in girth up to a certain limit, after which little further increase takes place. Growth in height, however, may continue for many years. A cross- section of the trunk of a Washingtonia shows that the bulk consists of a central cylinder made up of many bundles of stiff, brushlike fibers in the midst of softer tissue; this is surrounded by a narrow, denser and darker area, which merges into the outer, protective layer—the so-called "bark". In fact, the stem structure is very similar to that of sugar cane, which is also a monocotyledonous plant. An area of exposed roots at the base of the trunk is quite common in the older trees of many palm species.

Rapid Growth

The height development of some palms is quite rapid; several specimens of the Mexican Washingtonia

Fig. 7. Longitudinal section through center of a 5-year-old WASHINGTONIA ROBUSTA, showing leaf arrangement and growing point.

(Washingtonia robusta), which I have observed in New Orleans over a period of 11 years, have grown an average of two and one half feet a year. Other palms; *e. g., Butia,* are slow growers. All palms slow up in growth as they become older—not only as regards height but also in the gradual reduction of the leaf size and, consequently, of the crown as a whole. Some palms have a tendency to produce offshoots or suckers. If these are removed, a single-trunked specimen results; if permitted to remain, a cluster palm with trunks of various ages and sizes is produced. Examples of both types of growth-habit may be seen in the edible date palm and the Mediterranean fan palm.

The trunks of young plants of all the palms in Louisiana are covered with the old leafbases *("boots");* these may persist even when the palms have attained a considerable height, or, more often, they gradually fall off, leaving the trunk bare except just under the leaf crown. In the Washingtonias, some Sabals, and other genera, the boots accommodate themselves to the increasing thickness of the trunk by splitting upwards from their point of attachment into two halves, thus giving a crisscross effect. In the date palms, *Butia,* the Chinese fan palm *(Livistona chinensis),* and others, the

Fig. 8. Male spathe and spadix of PHOENIX CANARIENSIS. (Note that spathe was removed from the tree and propped up against a shrub for photographing).

boots do not split, but remain in one piece until they are shed. After the boots have fallen, the trunk is seen to be variously marked by leaf-scars—rings, or crescentic, oval, or other marks—indicating the former position of the leaves. The diamond-shaped leafscars of the Canary Island date palm *(Phoenix canariensis)* are very regular and clean-cut. The practice of chopping the dead or dying leaves from palms in cultivation frequently lends an aspect to the trunk quite different from its natural appearance in the wild. The mats or sheets of fibrous material *(mattula)*, visible between the boots or surrounding the bases of the leaf-stalks *(petioles)*, are the remains of the leaf sheaths, to be discussed later. In *Butia*, some of the date palms, etc., the sheath scars are also distinct, usually appearing as a series of lines or ridges between the more prominent leafscars (Fig. 4).

For convenience, palms may be classified into two groups on the basis of leaf form: 1. Feather-leaved *(pinnate)*; and 2. Fan-leaved *(palmate)* (Fig. 5). The first group is represented in our State by the genera, *Acrocomia, Arecastrum, Butia*, and *Phoenix;* the second, by *Chamaerops, Erythea, Livistona, Rhapidophyllum, Rhapis, Sabal, Serenoa, Trachycarpus*, and *Washingtonia*. The "sago palm" *(Cycas revoluta)*, whose leaves are used in Louisiana on Palm Sunday, is not a palm, but a cycad.

In the feather-leaved palms, the petiole continues into the leafblade as a midrib, or *rachis*, on either side of which, the usually numerous leaf segments arise. The individual segments are inserted folded upwards in the date palms; in *Butia*, they are attached folded downwards, like an overturned canoe.

The Fan-Leaved Group

The fan-leaved group show a definite juncture *(hastula)* on the upper surface of the leaf, where the petiole and expanded leafblade are joined; the hastula is often very distinctive in shape. The Carolina palmetto illustrates a fan-leaved type in which the midrib, especially noticeable on the under surface of the leaf, is strongly developed, the whole blade being clapped together and curved along its length (Fig. 6). In some palmate leaves, the petiole continues only a short distance, and in still others, it ends abruptly. The leafblade is cut or divided for a distance along the ridges of the fan folds, from the outer margin inwards, into primary segments; these may split again. Threadlike filaments or fibers dangle in the clefts of these segments in some fan-leaved palms: *e. g., Washingtonia*.

The petiole (leafstalk) is remarkably constructed and beautifully proportioned, gradually widening toward the base, to support the frequently large and heavy leafblade. It may be without armature *(Sabal)*, margined with claws or hooks *(Washingtonia)* or with needlelike teeth *(Chamaerops)*, saw-edged *(Trachycarpus)*, or appear as if chopped into long, flattened, spike-like spines *(Butia)*. The stout, sharp-pointed structures on the petiole of the date palms are in reality modified and reduced leaf segments.

Fig. 9. Branched flowering stalks of WASHINGTONIA ROBUSTA.

The terms, "palm cabbage", "heart of palm", or "palm bud", which are probably familiar to everyone, refer to that portion of the summit of the trunk of a palm, which consists of the young leaves closely enveloping each other and surrounding the young stem (Fig. 7). This is, indeed, the very heart of a palm, for here is located the delicate growing point. When the leaves are severely burned, or when a freeze comes along and the beautiful foliage is killed by the cold and whipped into shreds by the wind, the damage is but temporary as long as the bud has not been injured; new foliage will be put forth and the palm will, after a time, regain its normal appearance. In reality, a certain amount of protection is afforded this vital portion of a palm by permitting the dead leaves, or shag, to remain on the tree, or at least by not removing all the leaves up to the new season's growth. This practice of close pruning can be car-

ried too far in any event, since it makes for a very ungraceful, bald-looking crown. The tender palm bud is frequently eaten as heart of palm salad, or in some other fashion. Obviously, the death, of the tree follows the removal of its "heart".

"Cabbage Palms"

Although certain palms are called "cabbage palms", this is not because they are the only ones which possess a bud, or "cabbage", nor the only species having an edible bud. The common name, cabbage palmetto, usually refers to the Carolina palmetto, *Sabal palmetto,* in the southeastern United States. The comparison with a cabbage is, however, not strictly correct, because the leaves of a cabbage, no matter how expanded and curved about one another, all narrow down to a flattened base where they are attached to the central stem. Every young palm leaf, however, originates as a cylinder or tube, each new leaf being enclosed by the cylindric base of the one just older than itself. Since a palm leaf begins as a tube, it is easy to see that the visible leaf, in the ordinary sense of the term, is developed from one side of the tubular base as the petiole and blade, while the remainder is a *sheath.* The royal palms, which can be seen in Florida, illustrate this point admirably. A glance at the outermost leaf of the trunk at once shows the tubular base; besides, the whole leaf (sheath and all) drops off clean, leaving a narrow scar or ring which completely encircles the trunk. In many palms, however, the leafscar is not a complete circle. The sheathing base of the leaf has not kept pace with the increasing girth of the trunk and the succession of new leaves from within, and, after a time, the tension causes a gradual separation of the sheath from either side of the petiole. An inspection of a young Washingtonia, of which there are many in Louisiana, should make this clear.

Some palms produce flowers and fruits when fairly young; others first develop a considerable trunk Although palm flowers are individually rather small, they are frequently produced in enormous numbers, making very attractive flower clusters. In general, two types of flowering may be observed among palms in our State. The date palms and *Butia* species best illustrate one type. The appearance of a number of club-shaped structures *(spathes),* sometimes 5 feet in height, in the midst of the leaves indicates that the flowering period is at hand. Each spathe eventually splits down its outer face and reveals the large, branched flower cluster *(spadix)* (Fig. 8). In the date palms, the trees are either male or female, and so the fruits will later appear only on the trees which had female flower clusters. In *Butia,* there is a mixture of male and female flowers in every spadix; the male flowers shed their pollen and soon drop off, whereas the female develop into fruits.

Palmettos

The palmettos and the Washingtonias furnish a good example of another type of flowering, in which comparatively slender shoots, composed of many spathes overlapping each other and the central axis of the flowering stalk, appear among the leaves. These shoots grow enormously, eventually developing into large flowering stalks, the main branches of which emerge from beneath the spathes. In the Washingtonias, the shoots themselves are branched (Fig. 9). All the flowers of the palmettos, Washingtonias, and certain other palms contain both male *(stamens)* and female *(carpels,* or *pistil)* parts, and are capable of developing into fruits.

The fruits of palms are berries or drupes, generally containing a single seed or "nutlet" (stone). Most of the palms in southern Louisiana produce fruits annually. The fruits of the edible date palm are, as everyone knows, delicious in flavor and high in food value. Those of most species of *Butia* make excellent jellies, preserves, and wines. Birds are fond of the juicy, small, black or brownish berries of Washingtonias and palmettos. It may be of interest to point out that a species of palm, commonly called the double coconut or coco-de-mer *(Lodoicea maldivica),* of the Seychelles Islands in the Indian Ocean, bears nuts weighing 20 to 25 pounds or more. These are probably the largest fruits produced by a flowering plant in any part of the world.

EDITOR'S NOTE: Miss Bomhard spent several years in the study of palms while located at Tulane University. In co-operation with the Department of Conservation through the Division of Forestry it will be possible for the first time to give accurate information on the many palms grown in Louisiana and other parts of the country. This article will be followed by four others, in a series of five, and it is believed that a really comprehensive treatise on this subject will be available to the scientist, student and general public.

Knotless Lumber

After a study of trees from the forests of Mississippi, North Carolina, Florida and Wisconsin, Benson H. Paul, U. S. Forest Products Laboratory scientist, has learned how to produce knotless lumber.

In releasing the results of his studies, Paul pointed out that side branches on trees are responsible for knots on a log. Natural pruning of side branches is a snail's progress brought about by the limbs dying from exclusion of sunlight, he said.

"The decayed branches drop to the ground, leaving irregular stubs that often cling to the tree for 50 or 100 years before they are enclosed by new growth layers as a fence post by drifting sand," Paul said.

It is these broken branches that appear as knots when the trees are cut for timber.

To escape knot formation, Paul recommended early pruning of forest trees. That makes the pruning scars smaller and restricts them to the center of the tree. Branches, he said, always should be removed with a saw rather than an axe. A smoth cut close to the trunk permits immediate formation of clear lumber, according to Paul's report.

Paul is an associate of Arthur Koehler, famous wood expert called as a witness in the Hauptmann trial.

J. B. Dauenhauer, Jr., director of the Fisheries Division, Department of Conservation, and his Terrebonne enforcement aide, Johnny Foolkes, consider the possibilities of shrimp meal, now making very good paint, thank you!

EAT SOME OF THE SHRIMP—THE BALANCE WILL PAINT YOUR NEXT AUTOMOBILE!

The manufacturer of a glossy paint from the shell and head and other waste parts of the shrimp illustrates the far-flung ramifications of industry and particularly the possibilities of Louisiana's natural resources and their by-products. Nearly one-half of the edible shrimp goes to waste, so that the disposition of this by-product is an important branch of the industry.

Shrimp meal makes a very good commercial fertilizer and is also used for feedstuff, Germany being our principal foreign customer for mixed feeds; but there has recently developed a demand for the by-product from paint manufacturers.

Louisiana is the leading producer of shrimp, major sea-food industry of the state, and any profitable disposal of the waste contributes to the further development of the industry.

The by-products of Louisiana's natural resources and their derivatives will intrigue the interest of chemical engineers and other scientists whose advice is being sought by manufacturers and investors who wish to get in on the ground floor of Louisiana's new industrial expansion.

DEPARTMENT OF CONSERVATION

126 NEW COURTHOUSE BLDG.,

New Orleans, Louisiana

Whooping Cranes in flight. One of North America's rarest birds photographed in Louisiana. (Photograph copyrighted by Albert Dixon Simmons.)

Biological Natural Resources

By James Nelson Gowanloch

Unrealized by many otherwise observant citizens is the fact that many of Louisiana's rich natural resources have their basis in biological materials. Such resources are of peculiar value since, properly guarded against depletion, they restore themselves by natural processes so that just as a crop is harvested, resown and harvested again, so too the course of nature under proper conditions provides an ever-renewed stream of interest and of wealth. It is a purpose of this brief article to touch upon some of the unusual aspects of certain such Louisiana resources.

First, let us turn to a resource that in its major part is not of commercial interest, namely, the bird life of the State. It is a remarkable fact that although in all North America there have been found members of a total of sixty-five families, members of no less than fifty of these sixty-five families occur in Louisiana. In other words, although of the sixty-five families some are represented by only accidental occurrence in North America, nevertheless Louisiana, in spite of its lack of the land type diversity that high mountain ranges give, has represented in its bird life seventy-eight per cent of the total families of birds ever known to occur on the continent.

Ivory-billed Woodpecker

Louisiana possesses some birds of rare scientific interest. There is in the State under the constant guardianship of the Department of Conservation one of the last existing colonies of the Ivory-billed Woodpecker, a bird that once ranged from the Gulf of Mexico northward as far as Missouri, southern Illinois and southern Indiana, but is now on the verge of extinction. The Ivory-bill is the largest of all North American Woodpeckers and is undoubtedly the most impressive of them. Twice as long as a Robin with a wing spread of close to 3 feet, the male presents a brilliant scarlet crest and black and white plumage, while the female, though lacking the scarlet, displays a spectacular black and white pattern that will never be forgotten by the bird student fortunate enough to observe her. Shot for food and shot for the sake of its conspicuous bill which served as a trophy for the hunter, or simply shot because it was a good target, the Ivorybill has become one of the rarest birds in all of North America. Few indeed of even professional

ornithologists have ever seen this magnificent species. The Department of Conservation has the fine privilege of saving one of the last known colonies of this remarkable bird.

Louisiana can also boast another spectacular and rare bird species, the Whooping Crane, a large white bird (4 feet long, with a wing spread of as much as seven and a half feet) with dull red on the head and black on the wings. Formerly nesting from northern Canada to southern Illinois and Iowa, it wintered southward as far as central Mexico. Today no one knows whether thirty or two hundred Whooping Cranes remain in existence, but it is quite clear to all that they are near ultimate extermination. Whooping Cranes still survive in certain coastal areas of Louisiana, and indeed interesting recent evidence, worthy of careful examination, suggests that they may even breed in this State.

The Blue Goose

Louisiana is world-famous for its water fowl. Ducks and geese of many species find here ideal winter quarters. One of our water fowl is particularly worthy of notice. This is the Blue Goose. The reader has probably observed the additional photograph of the Blue Goose that appears on the cover of this issue of the Louisiana Conservation Review. First described for science in 1750, the nest of the Blue Goose remained completely unknown until seven years ago. For many of the intervening years the Blue Goose was regarded as a very rare bird until the discovery was made that Blue Geese wintered in great numbers on the Louisiana coast. We now know that the Blue Goose nests on various Arctic islands around the northeastern entrance to Hudson Bay. We further now know that at least ninety-five per cent of all the Blue Geese in existence spend the winter in Louisiana, not scattered along the coasts, but highly concentrated in certain especially favorable areas. One such area is the region around Main Pass, one of the passes of the Mississippi river. Another such region is Marsh Island, a 73,000-acre game refuge under the supervision of the Department of Conservation. The superb portrait of flying Whooping Cranes which accompanies this article was taken and is copyrighted by the distinguished bird photographer Mr. Albert Dixon Simmons in Louisiana. Not only has Mr. Simmons succeeded in stalking with his camera one of the rarest birds of the entire continent, but additionally has managed to achieve a flight record that matches in artistic effect the grace of a fine nature painting. Indication of the precise locality where this picture was taken is withheld because of the great rarity of these birds. Addicts of photography, however, may wish to learn that this Leica shot was made with a 135 mm. lens at 9:00 a.m. on a dark day with

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Blue Geese find winter haven on Louisiana's coastal lands.

Increase In Export Of Louisiana Oyster Anticipated

By
JAMES N. McCONNELL

Of the innumerable valuable natural resources of the State of Louisiana, oysters are one of the most important. The function of the Oyster Division of the Department of Conservation is not only to assist in the conservation of this valuable resource but to cooperate to the utmost in the development of the industry, which has grown to such tremendous proportions in our State.

An endless number of experiments have been and are being conducted with the view to improving the quality of our oysters and to insure to posterity an ever increasing supply. This Department is now cooperating with the Department of Commerce and Industry, together with interested citizens, in obtaining a lowered freight rate for live oysters in the shell. When this is accomplished, a large increase in the exportation of Louisiana oysters in their natural state will be assured. Our efforts are tireless in supporting and assisting the legitimate activities of the splendid people engaged in the oyster industry, and our prosecution of violators of the laws enacted for the protection of the oysters and the industry are rapid and fearless.

The "Louisiana Oyster" has been acclaimed by one of the greatest living authorities, Dr. P. S. Galtsoff, in charge of the oyster fishery investigations of the U. S. Bureau of Fisheries, as "the most delicious tasting oyster" he has found through-out his world travels in search of oyster information. The Louisiana Oyster has become widely and well known from one end of our country to the other. With 200 times the iodine content of milk and eggs, and 13 times as much iron as milk, this sea food has been recognized widely item in diets prescribed for persons suffering from pernicious anaemia, goitre and other disorders arising from improper mineralization of the by the medical profession as a major human body. Vitamin C, that energy-element so important to good health, is found in abundance in the Louisiana oyster. Oysters are remarkable among ordinary food substances in their high proportion of glycogen, a substance resembling starch but more readily and easily assimilated, and, unlike starch, wholly digestible even when uncooked.

Houma, the Oyster City

To make this delicious food available, the oyster industry has developed three main branches known, respectively, as raw shops, the sacked oyster or counter business, and steam canning. Raw shops are those establishments which receive either from their own fishing activities or from independent fishermen the live oysters which they shuck and can and which are refrigerated until they reach the ultimate consumer. Raw shops also sell shucked oysters in bulk and they usually handle other fish and sea foods as well. Houma, that thriving city in Terrebonne Parish, is the hub of this phase of the industry and is known from coast to coast as the Oyster City of the South. Sacked, or counter, oysters are live oysters delivered in the shell to the retail establishments where they are shucked for sale in bulk or over the counter on the half-shell. The oyster bars of New Orleans are famous throughout this country and connoisseurs visiting our city gravitate to these establishments to enjoy the unexcelled flavor of the Louisiana oyster. Steam canning has assumed the proportions of a major industry and Louisiana canned oysters are on sale everywhere throughout this country. This industry affords employment for a vast number of workers. Additional factories are now taking advantage of the Legislative Act authorizing exemption of state taxes over a period of ten years on all new industries locating in Louisiana. There are a number of steam canning plants located in our coastal parishes, and 75% of the oysters packed in Mississippi come from Louisiana waters. The Louisiana oyster is used throughout the United States as the standard of comparison and the unit of price fixing, all because of its superior quality.

Progress of the Industry

The progress of the oyster industry depends on three main factors: (1) natural conditions in a given section of the coast; (2) labor and market requirements, and (3) State and Federal legislation regulating the fishing and handling of oysters.

In all of these, Louisiana is particularly fortunate, having an available area for the culture of oysters comprised of more than a half million acres, a coast line with broad frontage on salt marshes, far away from human habitation rendering the oyster grounds immune from sewage pollution. The open winters make it possible to fish for oysters without interruption during the entire sea-

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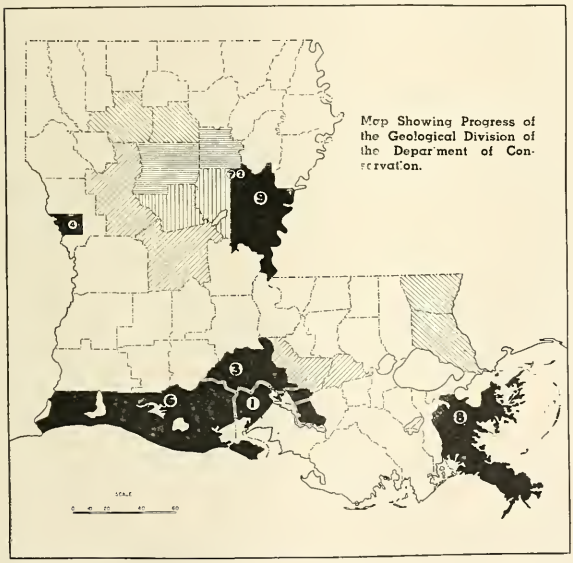
Geological Survey

DR. H. V. HOWE, Director
School of Geology of Louisiana State University and Director, Research Division, Louisiana Geological Survey

C. K. MORESI, State Geologist,
Louisiana Geological Survey, Department of Conservation

The Louisiana Geological Survey Division of the Department of Conservation has completed detailed geological and mineral resource reports on nine parishes since it was reorganized by the Legislature of 1934. Seven of these parishes are located in South Louisiana and one in North Louisiana. In addition to these parish reports, four reports dealing with the paleontology of three of the most important oil bearing formations of Central and South Louisiana have also been published. At the present time, reports on eight parishes in North Louisiana and four parishes in South Louisiana are being prepared. Reports on four of these parishes will be completed this winter, and should be available for distribution during the early part of 1938. Attached is map of Louisiana showing the parishes wherein geological reports have been completed and the parishes wherein geological field work is being actively pursued and reports being prepared.



Map of Louisiana showing areas, in black, wherein geological surveys have been completed and reports published by the Geological Division, under the direction of Dr. H. V. Howe. The shaded areas show the areas wherein surveys are being conducted and manuscripts are being prepared.

The large numbers within the black areas, refer to completed geological parish reports: ① "Geology of Iberia Parish"; ② "Geology of Lafayette and St. Martin Parishes"; ④ "Geology of Cameron and Vermilion Parishes"; ⑤ "Lower Mississippi River Delta: Geology of Plaquemines and St. Bernard Parishes"; and ⑥ "Geology of Catahoula and Concordia Parishes."

The smaller numbers within the circles, refer to the paleontological reports which have been published on some of the oil bearing formations of Central and South Louisiana: ② "Louisiana Sabine Eocene Ostracoda"; ④ "Louisiana Sabine Ostracoda"; ⑤ "Louisiana Jackson Eocene Ostracoda"; and ⑦ "Louisiana Vicksburg Oligocene Ostracoda."

The shaded areas show the parishes where geological surveys are being conducted and reports being prepared. In North Louisiana reports are being prepared on the following areas: Geology of La Salle and Grant Parishes, by Dr. H. N. Fisk; Geology of Caldwell and Wian Parishes, by J. Huner, Jr.; Geology of Natchitoches and Ranides Parishes, by Justin Rukas, and Geology of Bienville and Jackson Parishes, by Dr. R. Dana Russell. In South Louisiana reports are being prepared on the following areas: Geology of Ascension and Iberville Parishes, by Drs. H. V. Howe and R. J. Russell, and Geology of St. Tammany and Washington Parishes, by Dr. C. J. Roy. All of the above reports are being prepared under the direction of Dr. H. V. Howe and the staff of the School of Geology of Louisiana State University.

For some two years the Survey has been preparing a detailed report on the origin of the cap rock of salt domes with especial attention to the occurrence of sulphur. This comprehensive report should be available for distribution in 1938.

Two anthropological reports have also been published. The recent physiographic history of Louisiana is interrelated with pre-historic man, and information regarding pre-historic man is sometimes an important check on the Recent physiographic history of Louisiana.

As soon as surveys of parishes located in various sections of the State have been completed, the Geological Division will begin the preparation of geological reports of the entire State accompanied by a detailed surface geologic map.

Sale Of Anglers' Licenses At All Time High

Charles E. Jackson, Acting Commissioner of Fisheries of the Department of Commerce, reports that fishermen spent $8,002,887.31 for anglers' licenses in the United States during 1935-36. This is an increase of $993,878.21 over the amount spent in 1934-35, when the total revenue from that source was reported as $7,009,009.10. During this period their number increased from 5,121,320 to 5,832,448, an all-time high.

The average licensed angler spent one cent more for licenses in 1935-36 than in 1934-35, and two cents less than in 1932-33. There were approximately 1,000,000 more licensed anglers on the streams in 1935-36 than in 1932-33.

The sale of non-resident anglers' licenses in the United States increased approximately 35 percent, tourist licenses, 33 1/3 percent. Resident's licenses increased 14 percent and women's and children's licenses, 20 percent.

Effects Of Water Pollution On Aquatic Life*

by PERCY VIOSCA, JR.

I represent that department of your state government which is charged with the conservation and development of its natural resources. As inadequate development of any natural resource, like over-development, is poor conservation, public servants delegated to this task are between two fires, so to speak, as it is often hard to determine just where the happy medium lies. This is especially difficult when, by expansion, one important industry encroaches upon the rights of another.

With the above in view, the Department of Conservation has been conducting a series of scientific investigations into the physical, chemical, and biological factors which control, augment, or in any way affect, either favorably or unfavorably, the aquatic life of the State. The first investigations of this nature date back to 1917.

Because stream pollution is one of the important factors which retard the development of aquatic resources, the department has, from time to time, made surveys of the streams and lakes of this State which, during the past 20 years, have shown evidence of pollution of one kind or another. As a result of these studies, and others still in progress, Louisiana will be prepared to enter upon a period of sane constructive development of those aquatic resources which have suffered as a result of needless pollution.

As pure water does not exist in nature, and as fish cannot live in pure water, the term pollution is a relative one. Every year countless tons of dead leaves and the bodies and excretions of countless animals make their way into our streams, go through a normal biological cycle, and are eventually converted into fish and reflected in the fish population of our waters. The greater the rainfall, the greater the amount of this material reaching the streams, and the greater the fish crop as a result. Taking this tip from nature, it has now become standard fish hatchery practice to deliberately pollute the water with measured quantities of manure and other fertilizers. It is recorded history how the fish life of the lower Illinois River increased after the opening of the Chicago drainage canal in 1900.

In spite of the large volumes of polluting materials which normally pass through our streams every year, we occasionally suffer an overdose, sometimes from natural, sometimes from artificial causes. With some substances, a concentration of only a few parts per million will kill fish, render the water unfit for the maintenance of normal fish life, or give the fish or other aquatic life such objectional flavors that they are unfit for food.

Stream Survey

As a result of our stream survey, we have learned that there are several fundamental factors which determine the general character of our polluted waters. In the first place, we usually have larger volumes of water for dilution of our wastes, both actually and in proportion to our population and industries, than is available in other states where pollution is a more serious menace. Since most of our centers of population are along our large streams, our wastes often go unnoticed to the sea. It is in these, particularly, that purification by dilution does much to lessen the burden which would otherwise rest upon our shoulders, by bringing about quick action by mechanical, chemical, and bio-chemical purifying factors.

The chief agencies of man which cause radical changes in our waters may be summed up under domestic sewage and industrial wastes of various kinds. The effects of these are varied indeed, and depend not only on the volume and nature of the substances used but upon the chemical and physical properties of the waters into which they are dumped.

From the standpoint of fish conservation, sewage pollution is least important to us in Louisiana. It is largely a health question. Because of the rapid transformation of organic matter in our sewage polluted waters, these streams are usually benefited from the fisheries standpoint, large amounts of fish foods being developed from the organic matter contained in the pollution. Industrial wastes are a far greater factor in affecting fish life because they are not so easily subjected to biological purification as is domestic sewage. The causes of the destruction or depletion of the fish life in a body of water in which pollution occurs, may be included under several heads.

Depletion of the oxygen supply

is due to the oxidation of chemical wastes, to the decomposition of organic matter, to the respiration of aquatic organisms, or to any two or the three factors combined. It causes death by strangulation, the fish coming to the surface and struggling desperately, often jumping out of the water. There is great variation in the susceptibility of various groups of fishes.

*Address—Shreveport conference on pollution.

A shortage of food supply

results usually from a continuous disturbance, chemical or organic, which upsets the normal biological balance and stimulates the growth of undesirable forms. In such a case the vegetable feeders such as shad and shiners disappear first, followed later by the game species.

Disease

caused by fungus, bacteria, or animal parasites, may be stimulated by the unhealthful condition of the water and the food shortage, and thus pollution may be the indirect cause of depletion.

Destruction of young fish

may result from limited pollution which is not sufficient to destroy the less sensitive adults but achieves the same ultimate results.

Destruction of spawning areas

or nests may also result from pollution not concentrated enough to destroy adult fish. Fish eggs may be destroyed by direct contact with poisons or by water depleted of oxygen, or by sludge settling on spawning beds.

Direct poisoning

of fish is caused by greater volumes of toxic chemicals which, if of sufficient concentration, may result in immediate, rapid destruction of the entire fauna and flora coming under its influence. There is relatively little difference in the susceptibility of different species, but young fish are more sensitive and less likely to swim away from a polluted area.

Undesirable flavors

in fish may result from disagreeable substances in great dilution, which, even when not seriously disturbing the life of a body of water, may give characteristic flavors to the fish and make them undesirable for food.

The materials which pollute the waters of Louisiana may be classed as follows: Paper mill wastes, sugar mill wastes, miscellaneous trade wastes, gravel washings, city sewage, city drainage, and natural agencies.

Oil wastes

are varied, resulting from oil tanker discharge; refinery wastes, both oil and chemicals; and oil field wastes. The last consists of oil, salt water, and the various compounds dissolved in the brine. Conservation or trapping of the oils, checking by means of reservoirs with resulting oxidation and cooling of the brines, temporary summer storage of the brine, or pumping it back in the ground, are the methods of correction applied.

Paper mill wastes

are threefold: Pump, alkaline sludge, and wash waters in which sulphur compounds and salts of sodium are involved. Greater efficiency in the plants and settling basins for cooling and restoring a reasonable degree of chemical and biological stability to the wastes are corrective measures usually recommended.

Sugar mill wastes

consist largely of sugars and associated organic matters either lost accidentally or in washing vacuum pans, etc. Dry land irrigation, the use of the waste as fertilizer, or fermentation ponds or cess pools will correct this evil.

Gravel washings

do not directly kill fish but in various ways render streams unfit as fishing streams.

Miscellaneous other industrial wastes

not discharged with city drainage or sewage are largely organic in nature and present individual, usually simple problems of correction.

City sewage

is usually taken care of in our larger streams and gives us little trouble from the fisheries standpoint.

City drainage

because of the trade wastes contained therein, gives some trouble and engineering projects for its correction are necessary.

Natural pollution

results from various causes, among them a deficiency of oxygen during cloudy summer weather, poisoning by decomposition of aquatic plants, the droppings of caterpillars, the blowing in of too many green leaves by sudden violent storms, or the accumulation of mineral ash from forest and grass fires. Conservation of water levels and prevention of useless drainage will remedy the situation in some instances.

A pollution which may be harmless in cold weather when water holds much desirable oxygen may be deleterious in warm weather when water holds little oxygen yet the fish require more. Nature often takes care of this situation in the summer by stimulating the growth of microscopic green plants which produce sufficient oxygen during the day for the fish to breathe at night. When chemicals prevent the growth of these green plants, a waste which may be totally harmless in cold weather may be very destructive in summer. Besides, there is usually greater dilution during the winter than in summer.

We are well aware of the danger of permitting large volumes of polluting materials to be discharged into our streams, especially in summer when they cannot stand the added burden. Likewise, we realize there is often a far greater potential danger in permitting the accumulation of vast amounts of harmful substances. It is with a view to determining the safest and surest way to prevent such destructive pollution as was witnessed this summer, that your Department of Conservation is pushing to the limit, its studies of the various materials involved and testing their toxicity upon various species of fish so that safe and sane regulations can be made, and so that we can preserve and develop all of the natural resource industries of this State.

Louisiana's Gift to Milady

IDIOSYNCRACIES OF THE STYLISH MUSKRAT

by

ARMAND P. DASPIT

The Department of Conservation in the course of certain of its field investigations observed as long ago as last June that there existed a most serious reduction in the number of 'rat houses built in some of the areas under study.

Muskrats, like other wild animals, are subject to what may be termed "natural cycles"; that is, fluctuations in abundance that may be extreme and may extend over a whole continent, and yet are due to a succession of complex events.

Muskrats are subject to many parasites, including tularemia, a disease transmitted by biting insects. A second diseased condition, coccidosis, is produced by a protozoan organism that lives chiefly in the liver and intestines of the muskrats. The spread of coccidosis among the muskrats has been shown to be largely due to the conditions of weather, since if the weather is unusually dry, the water fails to wash away and dilute the waste products of the rats in their runs. The vegetation then becomes infected with certain stages of the parasite. Disease is thus communicated to other rats. The most careful studies of the coccidosis disease have failed to reveal any control measures beyond those of changing the general water level.

A typical Louisiana muskrat marsh in Cameron Parish. This area was highly productive during the winter of 1925-26.

Louisiana has occupied a unique position in the muskrat fur industry of the whole continent, since in a single year a total of 6,800,000 rats with a value of six and one-half million dollars have been taken within the State. This is the more remarkable since although muskrats of various species and subspecies occur from Newfoundland to Alaska and from California to Louisiana, yet the Louisiana muskrat, restricted in its distribution to the relatively small range of only southern Louisiana with a slight spread eastward into Mississippi and westward into Texas, nevertheless, in spite of this remarkably small range, contributed in a single year seventy-five percent of the total muskrat pelts taken in all North America. The figures for that season (1929-30) are as follows: the total catch of muskrats in the United States reporting areas was 8,435,583, of which no less than 6,269,556 were trapped in Louisiana.

Strict Enforcement

The Department of Conservation is keeping in close touch with the muskrat conditions and is doing all that is possible to add to our knowledge of the many contributing factors. It is, however, unfortunate

A few days old, its eyes not yet opened, but fully haired with fur that is to make it valuable in a few months.

that in the course of these very general and sweeping changes termed natural cycles, there is, as in the case of weather, nothing that human beings can do. The areas involved are so extensive and the numbers of individual muskrats so enormous that any type of medication is obviously impossible, as is also any adequate measure to alter the general water conditions. The only valuable contribution that can be made is the protection afforded by strict enforcement of trapping seasons.

Marsh Areas Best Suited for Muskrat Production

Areas adapted for muskrat production may be divided into three classes, grouped in order of their importance:

1. Coastal marsh areas.
2. Inland marsh and swamp areas.
3. Ponds, lakes, streams, artificial water ways and other aquatic areas without marshy borders.

More muskrats are produced per acre on land of the first type than on either of the others, and the majority of muskrats trapped are from these marsh areas. The vegetation is more abundant and propagation facilities are nearest the ideal.

Breeding

Muskrats breed any month in the year with the possible exception of November and December. The greatest number are born from the middle of April to the middle of September. Breeding is well underway in March in the tidal marsh areas of Maryland as is demonstrated by the number of pregnant females that are trapped during the month. Trappers in this area reported the following during one season:

Jan. 26—Olen Elzey reported a female with 4 embryos as large as mice.

Feb. 1—Perry Wallace reported four large embryos.

Feb. 19—Lee Newcomb trapped a female that gave birth to two offspring while in the trap.

Later records from this same area were more complete since the specimens were obtained for examination in nearly every case:

Jan. 26—One large embryo secured from Curtis Insley.

Feb. 24—Five small embryos from Gibbs' marsh.

Mar. 3—Seven small embryos from Gibbs' marsh.

Mar. 8—Five large embryos reported by Gibbs trappers.

Mar. 9—Five small embryos secured from Gibbs' trappers.

Mar. 10—Five small embryos secured from Gibbs' trappers.

Mar. 13—Six large embryos almost ready for birth reported by Gibbs' trappers.

There is evidence that muskrats breed late in the season because of the kits, or young animals, trapped during December and February. As late as March 8, a kit weighing about 6 ounces was caught on the Gibbs marsh and on March 13, one weighing 5 ounces was taken. The latest litter born in captivity in the experimental pens on the Blackwater Migratory Bird Refuge, Md., was October 30.

Size of Litters

The Department of Conservation of Louisiana requested the U. S.

A medicine dropper and some diluted canned milk came in handy in raising baby "musk-mice" by hand.

Bureau of Biological Survey to cooperate with it in making a study of the Louisiana muskrat. Arthur Svihla was selected to conduct this research and he began field work in this State in June, 1925, and carried on his investigations up to and including June 30, 1927. He reported the following:

"The number of embryos contained in 66 female carcasses varied from one to six—three and four occuring with, by far, the greatest frequency, thus making an average of between three and four to a litter. In 17 litters of mice found in the field, the numbers ranged from one to five—one, two, and three occuring most frequently. This seems to indicate mouse mortality."

The Biological Survey, in cooperation with the Maryland State Conservation Department, and the University of Maryland, made a similar muskrat study on the Eastern Shore of Maryland. Frank R. Smith was appointed to carry on this project and he began field work December 1, 1930, and continued to June 30, 1934. He reported the following:

"Ten records were made from trapped animals in the course of the work. Based upon these records there was an average of 4.4 young per litter."

Mr. Smith also studied the breeding habits of muskrats by confining them in pens. Twenty-seven litters of muskrats were born in pens and on these accurate data was obtained. This is given in the table below. It will be noted that the average is three young per litter with five as the greatest number in any one litter:

A typical muskrat house on the Cameron Parish marshlands where some of the finest muskrat pelts are taken each winter.

NUMBER OF YOUNG PER LITTER IN PEN-RAISED MUSKRATS ON THE BLACKWATER MIGRATORY BIRD REFUGE, IN DORCHESTER COUNTY, MD.

Number of Young Per Litter	Number of Litters
1	2
2	8
3	7
4	9
5	1

Ratio of Sexes

During trapping seasons that begin in late winter and include early spring more male than female muskrats are taken. This is believed to be explained by the fact that females are in hiding building their nests and preparing for their young. Records were kept during the trapping season of 1933 on the Gibbs' marsh in Dorchester County, Md. The following table shows that 64 per cent of the muskrats taken were males and 35 per cent were females:

MALE AND FEMALE MUSKRATS TRAPPED ON THE GIBBS' MARSH, IN DORCHESTER COUNTY, MD., 1933

Date	Number of Females	Number of Males	Total
Feb. 4	38	13	51
Feb. 18	44	24	68
Feb. 20	34	16	50
Mar. 3	27	16	43
Mar. 6	5	10	15
Mar. 9	19	12	31
TOTAL	167	91	258

MALE AND FEMALE MUSKRATS TRAPPED ON SCARBOROUGH MARSH, EASTERN SHORE OF MARYLAND, FROM 1926 TO 1932

Year	Males	Females	Total
1926	64	66	130
1927	77	21	98
1928	102	69	171
1929	15	19	37
1930	21	20	41
1931	203	198	401
1932	413	296	709
TOTAL	689	898	1,587

After its swim the muskrat reaches the shore with its pelage sopping wet.

Muskrat pelts from St. Bernard Parish. The skin on the left is the typical shade and color, but the skin on the right is of a light fawn or "champagne color." Quite a number of "Champagne" pelts are taken each winter from certain territories.

The sex ratio of muskrats produced in pens is probably the most reliable to furnish a true ratio of males and females since all the animals produced can be counted.

MALE AND FEMALES PRODUCED IN PENS ON THE BLACKWATER RIVER MIGRATORY BIRD REFUGE, 1931-32

Year	Males	Females	Totals
1931	10	8	18
1932	16	18	34
TOTAL	26	26	52

Gestation Period

During 1933 definite breeding experiments were planned to determine the gestation period of muskrats on the Blackwater Migratory Bird Refuge, Dorchester County, Md. Females and males known to be proven breeders were placed in individual pens. Each male was placed in a pen between two pens occupied by females. Five units of this type were arranged.

On mating day the male in the middle was placed in the pen on the left and allowed to remain over night. The next morning he was placed in his own pen and remained there one night. The following day he was placed in the pen on the right for one night, following which he was returned to his own pen to remain until the next mating day. At first the change was made every ten days, and under this system one litter of four young was secured on May 16, 1933. The female had been exposed to the male on the ninth, nineteenth, and twenty-ninth days previously. In order to give a more definite clue to the length of the period, the time between matings was extended to fifteen days.

On the morning of July 30, 1933, a young animal was found dead in one of the nests. It had evidently been born the night before and was perfectly developed in every way. The female had been exposed to the male on the fifteenth and thirtieth days preceding.

Three weeks later a most severe hurricane swept the Eastern Shore of Maryland, and the wind, rain and flood which followed wiped out practically all the breeding stock thus causing the work to be discontinued.

From the two records given above it appears that the gestation period of the muskrat is 29 or 30 days.

Plant Food

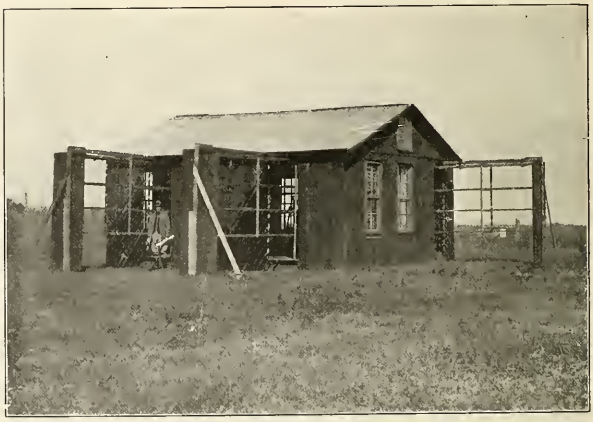
Below are listed the plants on which muskrats are known to feed, arranged as far as determined in the order of importance:

Three-square Bullrush, *Scirpus americanus.*
Saltmarsh Bullrush, *Scirpus robustus.*
Broad-leaf Cattail, *Typha latifolia.*
Narrow-leaf Cattail, *Typha angustifolia.*
Wild Reed, *Phragmites communis.*
Salt Grass, *Distichlis spicator.*
Rlnchospora pallida.
Eleocharis ochreata.
Salt Reed Grass, *Spartina cynosuroides.*
Salt Millet, *Echinochlea walteni.*
Cyperus ferax.
Needle Grass, *Juncus roemerianus.*
Flat-topped goldenrod, *Solidago teunifolia.*

Animal Food

Animal food plays a role in the diet of the muskrat. Fresh and salt-water mussels are often eaten. The heads and necks of various species of turtles are consumed, but generally speaking the turtles have al-

(Continued on Page 64)



House with drying racks extended for drying muskrat pelts in dry weather. This type of dryer is being adopted throughout the Coastal muskrat marshes of Louisiana by the larger rat ranchers.

Torsion Balance Exploration for Oil

By
V. GAVRILOVICH GABRIEL,[1] Sc. D.

Introduction

Today no reasonably well trained geologist or oil man will question the usefulness of geophysics in the solution of many geological and mining problems. Moreover, geophysical methods are often the only reliable tools in preliminary prospecting, especially in the area not suited for surface geological prospecting or in prospecting for deep salt domes and structures.

There are already a few well rounded publications on geophysics, such as:

R. Ambronn: "Methods of Practical Geophysics."

Beno Gutenberg: "Handbook of Geophysics" (In German).

C. A. Heiland: "Geophysical Methods of Prospecting," Colorado School of Mines Quarterly.

D. E. Key & A. S. Eve: "Applied Geophysics."

Barton, Blau, Clark, Eby, Heiland, Jenny, Ramon, Schmidt, Slotnick, Stubbe, Sundt, Weaver and Wilson of the United States; Shaw, Lancaster-Jones of England: Numerov, Nikiforov, Bahurin of the U.S.S.R.; Schwedyar, Jung, Haalck of Germany, Mekel of Holland, and many others have also made notable contributions to the theory and practice of Torsion Balance Prospecting.

At the present time many geologists and oil men with a limited knowledge of higher mathematics are cooperating with Torsion Balance units particularly in the Gulf Coast area. They need a sound understanding of principles and interpretations of Torsion Balance Exploration expressed in a somewhat non-mathematical form.

To cater to this demand, that is to explain in a somewhat non-mathematical way the principles and interpretations employed in Torsion Balance Prospecting, is the main purpose of this article.

Certain properties of minerals and rocks

We know very well that different minerals and rocks have their own peculiar color, hardness, luster or general appearance. No student of geology will ever fail to separate quartz from hematite, sandstone from limestone, etc. In addition to these more or less easy detectable properties, rocks and minerals can be separated and detected by modern instruments by their differences in electric conductivities in magnetic properties, in the velocity of propogation of seismic waves and in their densities or masses.

Density or mass of rocks

Torsion Balance Prospecting is based on difference in density or mass.

We know all material bodies are of different weight even for the same volume. Some rocks and minerals are relatively heavy and some are light, that is, they have different masses per unit of volume. For convenience one cubic centimeter is taken as a unit of volume, and the weight of one cubic centimeter of pure water at 4°C. is taken as equal to one gram. From many measurements the weights of one cubic centimeter in grams or density has been obtained for many rocks and minerals.

These data are given as follows:

MATERIAL	TABLE AFTER AMBRONN (Weight of 1cc.)	DENSITY
Water	is equal to 1 gr.	1
Oil	is equal to .9 gr.	0.9
Clay	from 1.8 to 2.6 gr.	1.8 to 2.6
Sandstone	from 2.1 to 2.4 gr.	2.1 to 2.4
Chalk	from 1.9 to 2.2 gr.	1.9 to 2.2
Rock Salt	equals 2.3 gr.	2.3
Gypsum	equals 2.3 gr.	2.3
Limestone	equals 2.7 gr.	2.7
Anhydrite	equals 2.7 gr.	2.7
Granite	equals 2.75 gr.	2.75
Diabase	equals 2.9 gr.	2.9
Pyrite (FeS)	equals 5.0 gr.	5.0
Magnetite (Fe03)	equals 5.2 gr.	5.2
Chalcopyrite (CuFeS)	equals 5.7 gr.	5.7

Manifestation of mass by Newton's Law

According to Newton all material bodies are attracted to each other with a force which is proportional to their masses and inversely proportional to the square of the distance which separates them. Mathematically it is expressed by the following formula:

$$F \text{ (Force of attraction)} = j \frac{m_1 m_2}{r}$$

where m m are the masses
r is the distance between two masses
j is a constant of gravitation

For convenience we call a force of attraction which exists between two masses of one gram each, separated by a distance of one centimeter, a dyne. A dyne is equal to one thousandth of one gram weight approximately only which is nothing but a pull exerted by earth on one gram mass at the earth's surface.

In Newton's formula for the force of attraction no limitation is put on the distances between two masses and their relative masses. It is natural to expect that the same powerful force of attraction exists between any material body placed on the earth's surface and the center of the earth. In reality, our so called

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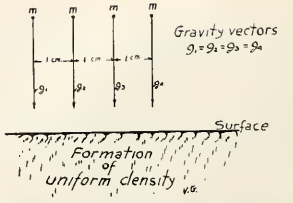
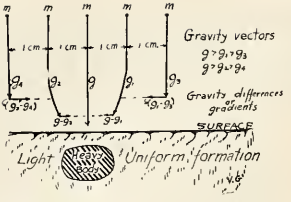
[1]Consulting Geophysicist and Geologist.
The author wishes to thank Mr. C. P. Dunbar, Consulting Geologist, for many helpful suggestions and Mr. J. A. Gerson, for making some of the drawings. He also wishes to thank Miss Frederica Killgore for checking over the manuscript.



Gravity vectors over uniform formation.



Gravity vectors over a heavy body in a light formation.

weight or pull is nothing but a force of attraction exerted by the earth. The force of attraction or pull on one gram mass at the surface is equal to approximately 981 dynes. It is somewhat smaller on the equator due to the rotation of the earth and larger in the polar regions.

The magnitude of a normal pull of gravity force due to the earth's attraction is known at many points or can be computed from the charts for any point on the surface of the earth. However, often the gravity values obtained from observations do not agree with the theoretical values due to the presence of local anomalies, that is due to the presence of unusually heavy or light material or formations and structures near the station of observation.

Pendulum and Gravity Meters

Pendulum and Gravity meters as they are used today give the values of total gravity, that is the attractive force at the point of observation. By subtracting the value of normal gravity as taken from charts the magnitude of a local anomaly is found.

General considerations of Torsion Balance Prospecting

One of the popular instruments to locate heavy and light masses and structures underground is the Torsion Balance after Baron Eotvos of Hungary. Torsion Balance is expressing local anomalies in "Gravity Gradients" and in "Curvatures" values. Gravity gradients point toward a heavy mass and away from a light one. On the very top of a heavy or light mass it is equal to zero. The magnitude and distribution of the gradients depend on depth, form, and material of an anomaly. The deeper the anomaly is situated the smaller the gradient. Curvatures also give some clues to the depth, force and material of the anomalies; moreover, in a cursory examination the curvatures plotted on the map often give a clear picture of the shape of a local anomaly because their directions often are parallel to the strikes of underground structures. Both gravity gradients and curvatures are expressed in Eotvos units where 10^9 or 1,000,000 Eotvos units are equal to one dyne.

Principles of Torsion Balance Prospecting

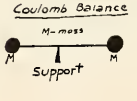
Suppose we have a mass of one gram placed on the surface of the earth at the stations separated by one centimeter intervals. The earth will exert a certain pull on our gram mass. This pull can be expressed in magnitude and direction, in so called gravity vectors. If the formation situated under the stations of obversavition will be of uniform density (See Sketch No. 1) the gravity vectors will be all equal to 981 dynes approximately and parallel in direction. The Torsion Balance placed at our points of observation would give no gravity gradients values at all.

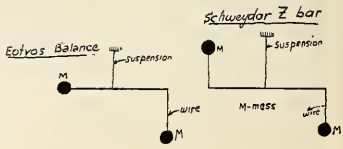
By observing gravity vectors at the stations situated over a heavy body (Sketch 2) we will be able to see that the vectors are neither parallel nor equal. The gravity vectors in the vicinity of a heavy body will deviate toward it. A Torsion Balance placed at the points of observation situated in the vicinity of a heavy body will yield gravity gradients and curvatures. Gravity gradients will point toward the density top and their magnitude will be equal to the maximum difference in gravity at the two points or stations separated by one centimeter and expressed in Eotvos units. The directions of curvatures also expressed in Eotvos units will give some clues to the direction of elongation of a heavy body underground. Over the density top the gravity gradients have the values equal to zero, whereas the curvatures values reach their maximum there.

Gravity vectors over a light body surrounded by a relatively heavy and uniform formation will be neither equal nor parallel. They will deviate away from a light body. A Torsion Balance placed over a light mass will give gravity gradients pointing away from a light density top. Their magnitude, expressed in Eotvos units, will be equal to the maximum gravity differences of two points separated by an interval of one centimeter. In other words the gravity gradients are nothing but a rate of change of vertical force of gravity per one centimeter of horizontal surface. Gravity gradients will be zero over a light density top.

Mechanical development of Torsion Balance

The mining men of old Greece nearly 300 years B.C. knew how to use a plumb bob. Coulomb, a French mathematician and physicist of the eighteenth century, invented the so called horizontal Coulomb Balance in order to measure the horizontal





forces. A Coulomb Balance is nothing but two heavy masses connected with a thin horizontal rod rotating on a vertical axis. In 1887 Baron Eotvos conceived an idea to put two masses on different horizontal levels and thus to be able to measure both the gravity gradients and the horizontal forces. Quite recently Schweydar of Germany has introduced the "Z bar" which is widely used in the construction of modern Torsion Balances.

Use of Torsion Balance

As it was pointed out before, Torsion Balance is able to detect unusually light or heavy minerals and rocks surrounded by the formations of somewhat different density. In some areas the Torsion Balance is widely used in mining to detect shallow salt mines, coal and mineral veins and dykes. Its use for pure geological research, for mapping faults and geology in general is well established.

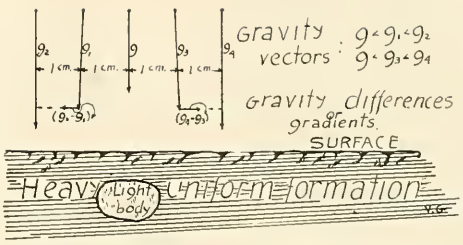
Favorable oil structures

Oil cannot be detected directly by Torsion Balance because oil and water have nearly the same density. However oil, especially in Texas and Louisiana, is usually associated with anticlines, monoclines, fault zones, volcanic plugs, salt domes, etc.

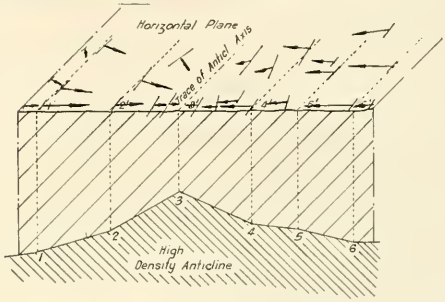
The sedimentary rocks which form all these structures are of different composition, and compactness, that is of different density; moreover many structures are deep seated and often no surface geology or surveying can give any clues to the conditions underground. It is quite natural that many scientists in the past have sought to apply Eotvos' Torsion Balance for exploration after favorable oil structures and have finally made a success of it.

Torsion Balance Surveying over structures

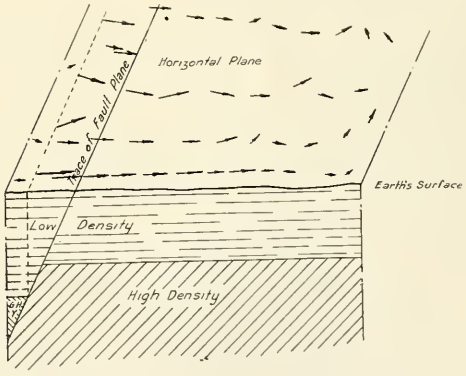
At the present time we have a wealth of data of Torsion Balance Exploration work checked by consequent drilling. For illustration a few somewhat simplified results of Torsion Balance Surveying over an anticline, salt dome, fault zone, are given diagrammatically. (See Sketches) Here gravity gradients



Gravity vectors over a light body.



Anticline of High Density.



Fault with an upthrow side on the right.

representing nothing but the rate of change of vertical gravity per one centimeter of horizontal distance are given in magnitude and direction. Curvatures are also given in magnitude and direction in some of the diagrams. It is worthy of noting that the larger gradients usually are observed at the surface points situated directly over the structural points underground showing an abrupt change of dip. It should be kept in mind that in some localities the anticlines are composed of lighter material than the surrounding formations and therefore there the gravity gradients will point away from the anticlinal structures. Salt domes carrying a heavy cap rock will act like heavy masses and gravity gradients over such a salt dome will point toward its density top. Salt domes buried at a great depth, or shallow salt domes which do not differ perceptably in density from the surrounding formations are often missed by Torsion Balance Surveying.

Guide table

The following guide table might be very handy in exploration for oil.

Torsion Balance Guide Table

By V. G. Gabriel

+means heavier or denser than the surrounding formations.
—means lighter or less dense than the surrounding formations

STRUCTURE	AGE	VERTICAL COLUMN
Anticline +more common Anticline—less common	Older formation + more common	upper—more lower + common
Syncline—more common Syncline + less common	Older formation — less common	
Fault + more common upthrow side Fault—less common	Younger formation — more common	
Salt dome with + a heavy cap rock		
Salt dome—more common		
Heavy lenses in + light formation		
Light lenses in—heavy formation		
Volcanic plugs, + igneous intrusions		

Remarks:

Gravity gradients will always point toward a heavy mass or "+ density" and away from a light mass or "— density".

Plotting of Torsion Balance results

The results of Torsion Balance Surveying are given in gravity gradients maps and in isonamalic lines (isogams) that is in the lines of equal gravitational anomalies. Recently, it is a common practice to express the density anomalies in isogams.

Isogaming is based on a principle that the Torsion Balance gravity gradients represents the rate of change of vertical force of gravity per centimeter of horizontal plane passing through the point of observation. Hence at a certain point situated, let us say 100 meters from the point of observation along the direction of the gravity gradient, the vertical gravity will be equal to the gravity at the point of observation plus distance expressed in centimeters multiplied by the gravity gradient at the point of observation expressed in Eotvos units. Expressed mathematically, this is

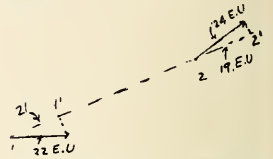
G 100 =

G obs.+100.100.X Eotvos Units

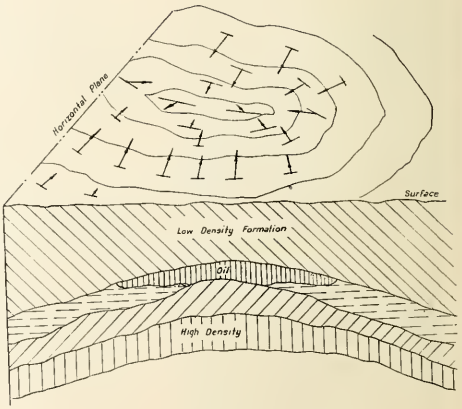
where G obs.—gravity at the point of observation

X —gravity gradient at the observation point

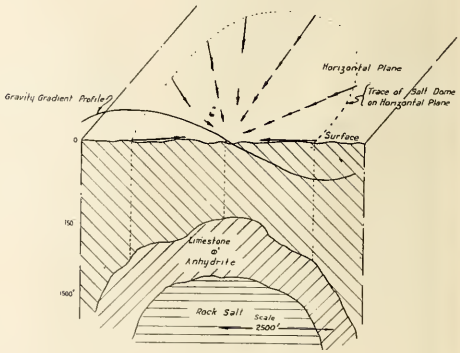
Difference in vertical gravity between two points of observation separated, let us say, by 1000 meters is computed in a graphical way as follows:



Given: Distance 1-2 equal 10000 meters = 1000x100 cms. Gravity vectors 1 and 2 also given in direction and magnitude.



Gravity Gradients and Curvatures over an High Density Anticline.



Salt dome with heavy cap rock.

*Sawtelle, George: "Salt Dome Statistics", A.A.P.G. Bulletin, June, 1936, Vol. 20, No. 6, page 728.

Solution: Let us connect the stations 1 and 2 and let us drop the perpendiculars from the ends of the gravity vectors on the line connecting the observation stations. Suppose our perpendiculars will intersect the line 1-2 at the points 1' and 2'. By measuring we found that the lengths of 2-2' is equal to 19 E. units and of 1-1' is equal to 21 E. units. Hence the different in vertical gravity between the stations 1 and 2 is

$$\frac{21 + 19 \times \text{Distance}}{2} = \frac{21 + 19 \times 100000}{2}$$

$= 2000000$ Eotvos units

By computing these gravity differences for many stations and by connecting the points of equal deviation we obtain the so called, isonomalic lines or the isogams. Isogamic contours are usually drawn from one to five hundred thousands Eotvos units apart. In practice the method of isogamming is more complex and calls for certain application of the Theory of Least Squares.

Sawtelle* in one of his articles summarizes the results of Torsion Balance Prospecting for salt domes in Louisiana and Texas as follows:

Salt Dome discovered in

Louisiana	Texas	Total
7	26	33

Conservation and Co-operation

(Continued from Page 5)

Now I have been interested in a recent development of camping procedure, which is the opposite of regimentation—that is, it is designed to develop the individuality of a lad. Only a few take to the woods together—and they seem to follow pretty much their individual preferences as to the trail and camp routine.

You will readily understand that we have here an opportunity to evaluate the true principles of conservation—to conserve the health of our youth through outdoor exercise, to inculcate the spirit of sportsmanship that will lead to an observance of our regulations, not only in the preservation of our wild life, but in the stopping of stream pollution and dissipation of our crude oil and natural gas resources.

So that we get back to that word co-operation, which sounds so vague and futile. We must have the co-operation of this generation of our citizens if we are to plan for the future, if we are to make any headway in building a better and happier state for our children and our children's children.

This is by no means intended as a disparagement of other sports, such as baschall and football, tennis and golf and the gymnasium. All have their place in the physical development of our modern youth—but the point I wish to make is that we should also popularize our fishing and hunting grounds, see that they are rendered inviolate from the further encroachment of our mechanical civilization, see that they are utilized as an important factor in the future health and happiness of our people.

Nature has done her part for us here in Louisiana, giving us the foundation on which to build. In the conjunction of our fresh and salt water there is an abundance of food elements that sustain a variety of marine life not equalled by any other section. And with its 7,000,000 acres of marsh land it is the ideal winter harboring place of the wild life of America.

The Department of Conservation has certain prescribed duties and objectives with which my readers are no doubt familiar; and if I have suggested to them some of our ideals, in our interpretation of the broader concepts of conservation, the effort will have been worth while.

Small Torsion Balance with sun tent. (Courtesy of The American Askania Corporation, Houston, Texas.)

Petroleum Geologists To Meet In New Orleans

The swift expansion of the oil industry of Louisiana will receive further impetus this coming Spring when the American Association of Petroleum Geologists holds its annual meeting in New Orleans, at the Roosevelt Hotel, March 16, 17, and 18.

Members of this Association are the men whose advice is followed by the oil industry in its exploration and prospecting work and worldwide interest in the continued development of South Louisiana adds to the importance of the meeting.

Heretofore the annual meetings of the Association have been held in western oil centers, but for the past three or four years the attention of petroleum geologists has been focused on the interesting character of the costal region, the salt domes and sedimentary depositions that are being disclosed by deeper drilling and the research of geophysisists and paleontologists.

Prof. R. A. Steinmayer, of Tulane University, who has contributed to scientific publications many papers discussing the salt domes of Louisiana, is an active member of the Association and has neglected no opportunity to impress his fellow members with the attractions of New Orleans. With the help of Mayor Robert Masetri and Commissioner William G. Rankin, of the Department of Conservation, he made a strenuous campaign at the Los Angeles meeting last year and succeeded in having New Orleans named as the 1938 meeting place.

Louisianian Elected

The Association also honored Louisiana by electing C. L. Moody, of Shreveport, vice-president. Mr. Moody is district geologist of the Ohio Oil Company and is considered an authority on the geology of North Louisiana, South Arkansas and Northeast Texas. H. B. Fuqua, of Ft. Worth, is President of the Association.

There were over 1,000 registrations at the Los Angeles meeting and more convenient location of New Orleans with respect to the entire industry is expected to draw an even larger attendance.

Most of the geologists now directing the development work in South Louisiana have their offices in other sections, in New York, Tulsa, Houston and other oil centers, and the next annual meeting in New Orleans will give them an opportunity to inspect the drilling operations in the company of their colleagues and friends. The new technique and special devices that have been developed for marine work along the Gulf Coast will be of special interest.

Dr. H. V. Howe and his associate of Louisiana State University, Dr. R. J. Russell, have recently completed a detailed report on the lower Mississippi River Delta, in which there is a discussion of the great Geosyncline of the north shore of the Gulf of Mexico, the most active Geosyncline on the North American continent, and the visiting geologists will be able to inspect the surface area of southeast Louisiana in the light of these studies and revelations.

Dr. Howe, who is in charge of the geological research work of the Department of Conservation, is primarily responsible for the increasing interest that is being taken by the oil industry in all sections of Louisiana. Some of the theories advanced by Dr. Howe several years ago have been tested and proven by the field exploration work of seismograph and deeper drilling.

Prof. Steinmayer will be general chairman in charge of all meetings. C. L. Moody will be chairman of the technical program committee

C. L. Moody, vice-president, American Association of Petroleum Geologists. District geologist, Ohio Oil Co., Shreveport.

Prof. R. A. Steinmayer, general chairman. Professor of Geology, Tulane University, New Orleans.

C. E. Cook, chairman, Entertainment Committee. District geologist, Humble Oil & Refining Co., New Orleans.

which will have charge of conducting and arranging for all technical papers and lectures. Dr. Howe is vice-chairman of this committee.

The reception committee will be headed by C. I. Alexander, district geologist of the Magnolia Petroleum Company, with headquarters at Lake Charles. C. E. Cook is chairman of the entertainment committee; T. R. Eskrigge, geologist of the Gulf Refining Company, at New Orleans, is chairman of the transportation committee; J. E. Lytle, of the United Gas System stationed at Hattiesburg, is chairman of the hotels committee; Donald Goodwill, Jr., engineer of the Department of Conservation, is chairman of the golf committee and C. K. Moresi, state geologist of the Department of Conservation, is chairman of the publicity committee.

Field Trips Planned

Roy Hazzard, chairman of the Field Trips Committee and also District Geologist of the Gulf Refining Company at Shreveport. has selected the following to serve on his committee:

B. W. Blanpied, geologist of the Gulf Refining Company, at Shreveport; Urban B. Hughes, geologist of Eastman Gardiner & Company at Laurel, Mississippi; James H. McGuirt, assistant state geologist, Louisiana Geological Survey, at Baton Rouge; Martin N. Bronghton, paleontologist, The Texas Company, at Shreveport; and Paul T. Seashore, Vice-President of the Louisiana Land & Exploration Company, at Houma.

Mr. Hazzard has been stationed at Shreveport as district geologist for a number of years and is familiar with the geology of Louisiana. The following field trips have been planned to take place after the regular sessions of the convention:

A geological field trip into Smith and Wayne counties, Mississippi, to study the relationship of the Vicksburg and Chickasawhay formations of the Gulf Coast region. The Vicksburg formation is an important oil bearing formation in South Louisiana. Mr. Hughes and Mr. Blanpied will lead this field trip, which is planned primarily for Gulf Coast paleontologists and geologists interested in the "so-called" Oligocene-Miocene problem.

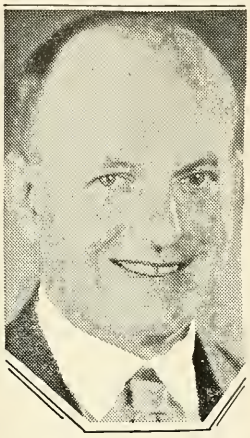
This two-day trip will be by bus, leaving New Orleans Friday, March 18th, and spending Saturday, March 19th, and Sunday, March 20th, in the field, returning to New Orleans Sunday night, March 20th. Headquarters for this trip will be at Laurel, where provisions can be made to handle a maximum of seventy-five individuals.

Another trip is planned to take in the interesting physiographic features of the Teche country, the salt mine and botanical gardens of Avery Island. James H. McGuirt, assistant state geologist, will be the leader of this trip, which will be made by automobile on the Saturday following the convention.

Through the courtesy of R. C. Stewart, division engineer of The Texas Company, at Shreveport, and Paul T. Seashore, of Houma, another interesting trip has been arranged to embrace numerous oil fields in the waterways of Southeast Louisiana. Speed boats will provide for a maximum of fifty individuals on this trip, which will be very interesting to members of the Association not acquainted with the marine drilling equipment and procedure used by The Texas Company in its water operations. It will be a one-day trip, with luncheon at one of the Company's field camps.

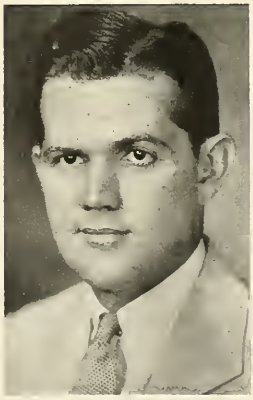
There will be another automobile trip for those members who wish to

(Continued on Page 66)



Dr. H. V. Howe, vice-chairman, Technical Program Committee. Director, School of Geology, Louisiana State University; director, Geological Survey, Department of Conservation; member, State Mineral Board.

T. R. Eskrigge, chairman, Transportation Committee. Geologist, Gulf Refining Co., New Orleans.



Donald Goodwill, Jr., chairman, Golf Committee. Engineer, Louisiana Department of Conservation.

C. K. Moresi, chairman, Publicity Committee. State Geologist, Louisiana Department of Conservation.

Law and Sporting Practices

(Continued from Page 35)

and in communities where they do not it is usually owing to lack of proper interest on the part of sportsmen who should be militant in protecting their rights and equities in wildlife. Strong public sentiment is seldom ignored by public officials.

A conservation issue that has been hotly debated in recent years concerns the practice of luring fowl to the shooting grounds with bait. The use of feed or bait to lure waterfowl in great numbers to shooting grounds came into vogue in this country when our Continental supply of waterfowl had dwindled to the extent that there were not sufficient birds to permit of wide dispersal and still afford opportunities for hunters to get the kind of shooting they had been accustomed to during the years when waterfowl were abundant. Those who owned or leased shooting properties and could afford to buy tons of corn and other feeds to lure waterfowl to their respective properties by the thousands continued to enjoy bag-limit shooting day in and day out, but those who could not afford to buy bait and maintain private shooting grounds had to be content with what shooting they could get on public waters and when such public waters were adjacent to private shooting grounds that were baited, shooting was invariably poor. The writer can attest to this from personal experience. Gradually many sportsmen became resentful of this state of affairs and demanded that the shooting of waterfowl on baited areas be prohibited. Numerous efforts were made to get such a regulation put into effect but those who favored baiting were strong and well organized and successfully resisted all efforts of the opposition until that great champion of wildlife conservation, Jay N. Darling, was made Chief of the U. S. Bureau of Biological Survey, which administers the Federal migratory bird laws. He was adamant in his demands for Federal regulations that would give our vanishing migratory waterfowl a fair deal and an opportunity to increase, and during his tenure of office such regulations were put into effect including one prohibiting the taking of migratory waterfowl and mourning doves by means, aid, or use, directly or indirectly, of corn, wheat, oats, or other grains or products thereof, or any kind of feed whatsoever. In addition to affording unequal opportunities for hunting and creating artificial conditions, it is unquestionable that baiting contributed in large measure to the depletion of our migratory waterfowl and the practice should never again be permitted.

Conservation With Use

When we speak of wildlife conservation the assumption is that we mean conservation with use, for under sensible management and with proper cooperation from sportsmen we can enjoy a reasonable amount of sport and still maintain sufficient brood stock to replenish our coverts from year to year. When we leave sufficient brood stock in our coverts at the end of the hunting season to insure replenishment through natural reproduction during the next breeding season, we have practical conservation, but if for instance we produce ten million ducks and kill off this ten million during the next hunting season and an additional two million of the brood stock that produced them, we are headed for gradual extermination of the species, and that is exactly what was happening to our migratory waterfowl until the Federal Government stopped up the gap between production and destruction by such restrictive measures as shortened seasons, reduced bag limits, three shell limit on shotguns, and prohibiting the killing of these birds over baited areas. As a result of these restrictive measures, establishment of refuges along major flyways, restoration of nesting areas in the United States, and natural improvement of nesting conditions in Canada, it now appears that the waterfowl depression has been checked, and reports received during the past two years indicate that there has been a slight increase. Even with these measures in effect, however, it will probably be quite some time before migratory waterfowl increase to an extent that would justify much liberalization of recent hunting regulations put into effect to prevent their extermination. Unfortunately game can be killed off much more rapidly than it can be restored, and this is one of the penalties of excessive destruction by man and destruction by elements over which man has little or no control.

The wildlife of the Nation belongs to all of it's citizens. It affords us wholesome recreation and communion with Nature, so let us use it wisely and guard it zealously to the end that our posterity too may know the joys it affords.

Federal Aid For Wildlife

Sportsmen's money will benefit national wildlife resources under the terms of a bill recently introduced into Congress. Funds now going into the general coffers of the U. S. Treasury will be diverted to the restoration of wildlife in all the states if this bill becomes a law.

No additional taxation is provided. This measure simply diverts taxes, which have been paid by sportsmen on arms and ammunition since 1932 into the General Fund, to a special Federal-Aid-for-Wildlife Fund to be returned to the states for wildlife restoration. The bill provides that this money shall be allocated to the states on the basis of area and the number of hunting licenses which are sold in that state.

State game commissions will submit to the Secretary of Agriculture for approval specific wildlife restoration projects for their respective states. The federal government will provide from the proposed fund seventy-five per cent of the cost of these projects and the state must provide the other twenty-five per cent. It is estimated that from this source about four million dollars will be made available for wildlife restoration.

This Bill has the endorsement of the American Wildlife Institute and the General Wildlife Federation. Both organizations are urging public support of the Bill.

Biological Natural Resources

(Continued from Page 45)

a f6.3 aperature and one two hundredth a second exposure on Eastman Super-X film.

Highly interesting is the further fact that the Blue Geese in performing their southward migration in the fall apparently complete their journey in one non-stop flight, since few autumn records are obtained by the thousands of bird watchers who carry on systematic observations in the intervening territory. Northward bound in the spring, the Blue Goose follows a different schedule and travels along, stage by stage, on the fringes of retreating winter.

Water Fowl

Louisiana offers probably the finest water fowl hunting in the entire country. Enthusiasts from over the entire country who seek their legal kill of ducks and geese here pursue that sport under ideal conditions. The concentrations of water fowl are amazing in spite of the fact that the numbers of ducks and geese throughout the continent as a whole have been heavily cut by drought, by the increased volume of hunting and by many other factors.

Louisiana by its very nature will inevitably remain one of the Nation's most important water fowl areas, both for hunting grounds and sanctuaries.

Turning now to other natural resources, biological in origin, two can be mentioned in conclusion. It may seem odd at first glance to associate in any important way muskrats, sea shrimp and the Mississippi river, yet there is, in reality, a relationship of deep significance. The Mississippi river drains parts of thirty-one states and parts of two Canadian provinces, an area of one and a quarter million square miles, equalling roughly half the total land area of the United States. The load of silt that the Mississippi transports from its drainage basins is astounding. It has been estimated that over four hundred million tons of silt are transported annually seaward, a total seven times as great as the yearly silt load of the Nile. This sediment, carried from such far fields and laden with such a variety of valuable elements, exerts a profound effect upon the character of the delta lands it builds. Further, together with the elements already dissolved in the waters of the Mississippi it exerts a vast influence upon the character of the adjacent waters of the Gulf of Mexico. The formation of coastal prairies, the typical coastal marshlands that form where Louisiana meets the Gulf, is profoundly affected by the Mississippi's activities.

Muskrats

Turn now to muskrats. There exist in North America three separate species of muskrats. One, the Newfoundland Muskrat, is confined to the island of Newfoundland. The second, the American Muskrat, is widely distributed, occurring from the Arctic Barrens and Hudson Bay southward to the Mexican border. The third is the Louisiana Muskrat, a species of extraordinarily restricted distribution since it is confined to southern Louisiana with an eastward extension into the Pearl river area of Mississippi and somewhat westward into eastern Texas. Contrast therefore the wide range of the American Muskrat with the extremely small range of the Louisiana Muskrat, then examine Louisiana muskrat production. In the year 1929-30 the total United States production was 8,400,000 pelts. The total Louisiana catch was 6,300,000. The remarkable and impressive fact is that Louisiana produced over three-quarters of the total muskrat crop of the whole United States. Such productivity is undoubtedly due to the peculiar environmental conditions created by the action of the Mississippi river. In their course from trapping lands to fur markets, it can easily be seen how important these muskrat pelts become in terms of livelihood and prosperity to Louisiana.

Turn now to sea shrimp. Three species of marine shrimp enter into the commercial catch in Louisiana. One of them, the Common Sea Shrimp, frequently called the Lake Shrimp, forms about ninety-five per cent of the total catch. If we now examine Louisiana's production figures for commercial sea shrimp we find that in 1936 the yield totalled 60,000,000 pounds. Let us translate this into more tangible terms. Sea shrimp run from twenty to forty individuals per pound. A conservative average length for sea shrimp is five inches from the tip of the head spine to the tip of the tail, disregarding entirely the long thread-like antennae. Let us take therefore a conservative average of thirty shrimp per pound and our 60,000,000 pounds become 1,800,000,000 individual shrimp. Computed at the average length of five inches and placed end to end, this row of shrimp would extend the amazing distance of over 142,000 miles, a continuous line of sea food that would extend, in other words, more than seven-credible quantity of commercially twelfths of the distance from the earth to the moon. This almost invaluable sea food, constituting half the total shrimp production of the entire United States, came, in a single year, from the coastal bays, coastal bayous and coastal waters of Louisiana, a vast productivity that again bears an undoubted direct relation to the fact that the Mississippi river contributes to the Gulf of Mexico suspended sediments and dissolved elements that make possible such rich growth of sea life.

Shrimp

Adjusting itself to changing market conditions and demands, the shrimp industry is steadily progressing. Once the least known of all our sea food animals, the sea shrimp has been the subject of cooperative investigations established with headquarters in the Department of Conservation six years ago, and has now yielded clear and necessary knowledge of its life history, growth, movements and other scientific information essential in determining proper close seasons and other protective regulations. These cooperative shrimp investigations are carried on by the Bureau of Scientific Research and Statistics of the Department of Conservation of Louisiana in cooperation with the Bureau of Fisheries of the United States De-

partment of Commerce. The states of Texas and Georgia are also cooperating with the United States Bureau of Fisheries in certain aspects of the program. As a result of these researches, the sea shrimp has emerged from its obscurity and become one of the best understood of all important North American sea foods.

These scattered instances here cited are but a few arbitrarily chosen examples of rich Louisiana natural resources that have their basis in biology. Omitted have been the equally rich biological resources that have their foundation in forests and other plant life. The possibilities of prosperity from such biological resources are almost limitless because of the fact that under proper care they are by natural processes renewable.

The proper exploitation of them and their proper control based upon scientific principles spell future happiness and success for Louisiana.

o

The Louisiana Oyster

(Continued from Page 46)

son. There is a greater abundance of experienced labor here than in any other oyster producing area. Our sity of looking to the waters which lap our shores for their livelihood, and they have progressed with the business, adopting and putting into practice the principles which have been developed by the Department of Conservation and the U. S. Bureau of Fisheries to aid this industry. We have a natural market at our very door. Transportation facilities enable shippers of the Louisiana oyster to make known its wonderful qualities far and wide throughout our country.

A remarkable fact is that even though tremendous strides have been made in the past twenty years of organized effort, the opportunities are greater today than ever before.

The lawmakers of our State have always been very forward thinking in their consideration of the problems of oyster conservation and the development of this most important industry. Through legislation it is possible to lease the fifty odd thousand acres of natural oyster reefs, which are covered with wild oysters, for a period of fifteen years, with the privilege of renewal for ten years, at the surprisingly low figure of $1.00 an acre per year. Through legislation, this Department is enabled to and does with assiduity patrol the water bottoms. Violators of privileges, destroyers of bedding grounds or the oysters themselves are brought speedily to justice.

Perpetuation of the Industry

In 1929 the Department of Conservation, looking forward to the perpetuation and development of the oyster industry in Louisiana, issued an edict requiring all packers to return ten per cent (10%) of all oyster shells opened by them during the season. These shells are bedded under the supervision of this department and are placed on the bottoms without cost to the State except for the small amount paid for supervision. In May 1929, 60,000 people have for a great many years recognized the value and the necesbarrels of clean shells were bedded as cultch. Since that time the amount has steadily increased. This year 75,000 barrels of clean shells were placed in chosen spots and will serve as the resting place for millions of the young spat resulting from this summer's breeding, and in two years time we can reasonably expect an increase of four to one, or approximately 225,000 barrels of mature oysters ready for the market from this planting alone.

The progress this State is making through its work of conservation is due in a large measure to the intelligent cooperation of the public in all of the activities of this Department. This attitude now manifests itself in all lines of conservation activity and is growing from year to year as the benefits of conservation become better know. Real control and conservation come only through co-ordination of science and experience, aided by the cooperation of the people.

Louisiana's Gift to Milady

(Continued from Page 54)

ready been killed. Parts of crabs and fish that are extremely sluggish in their movements are caught and eaten. Muskrats have also been seen eating dead birds and snakes.

Muskrats consume chiefly vegetable matter but sometimes indulge in animal food. In the coastal marshes, particularly in the South, where the water is brackish, the favorite food of the muskrat is the tender bases, roots, and tubers of the three-square rushes, (mainly Scirpus americanus, Scirpus Olneyi and Scirpus robustus), and cattails (Typha angustifolia and Typha latifolia). During the summer the roots and bases as well as the tender leaves of the above mentioned plants are eaten. Certain plants are favored by the muskrats but they will eat a great variety of aquatic plants.

Diseases

While diseases occur among muskrats, no comprehensive study of their various abnormalities has been made. On marshes where the physical conditions are good and overabundance is prevented by reasonable trapping, it is seldom that reports of extensive losses are heard.

Coccidosis, produced by a protozoan organism living in the liver and intestine, does occasionally cause heavy loss in muskrats when the water level in their marsh is lowered. Failure of the usual water supply to wash away and dilute their waste products in the runs is followed by an extensive infection with this organism from contamination. No treatment for the control of this disease is of any value. When feasible, regulation of the water supply will check the condition.

Tularemia, an infectious disease of many forms of wildlife, has been found to occur in muskrats. A few human cases have been contracted from skinning these animals. This condition is usually transmitted in the wild by biting insects but no control measure is yet known.

Pseudotuberculosis has been observed on rare occasions among muskrats in the wild state.

Necrobacillosis has been noted in these animals when maintained in small pens and on open marshes. This disease does occasionally assume the proportions of a rather widespread epizootic.

Parasites

The life habits of muskrats with reference to their food and nesting exposes them to heavy parasitic infestations. Because the flukes

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(trematodes) require aquatic forms of life in which to complete their life cycle, these parasites are likely to become very numerous in muskrats. On some occasions very heavy infestations with these worms are observed.

In addition, muskrats are sometimes parasitized with the larval encysted form of a tapeworm which is adult in animals of the cat family. These cysts known as *Cysticercus fasciolaris* and caused by the immature stage of the tapeworm *Taenia crassicollis* may be very numerous in the affected animal.

Lice and fleas have frequently been found on muskrats but they appear to become excessively numerous and injurious only when the animal is otherwise weakened from infectious disease, internal parasitism or lack of proper food.

EDITORIAL

BY THE COMMISSIONER

The Problem of Pollution

We are all human, creatures of emotion whatever may be the degree of our intelligence; and we are apt to lose our sense of proportion or perspective in the presence of some temporary agitation.

Surely we can sympathize with our anglers who are rising up in their wrath and demanding that the poisonous fangs of industry be removed. On the other hand we are committed to the industrial development of our state—we are in the midst of a campaign to encourage the establishment of new industries and we are anxious that no ill-considered action on our part should have an unfavorable reaction in this direction.

We must bear in mind that the conservation of our natural resources has taken on a broader significance since the laws were placed on our statute books; that the preservation of our wildlife, the prevention of the pollution of our streams and the waste or dissipation of our crude oil and natural gas, does not encompass the full measure of our problem; that we are also concerned with the conversion of these resources and their derivatives so that they will yield the greatest returns to our state and our people.

This brings us to the door of industry itself. Conservation and industry have a great deal in common —our natural resources not only provide the raw materials for industry, but they provide a background or environment of varied recreation and diversion for the workers in industry, helping to reduce the rate of labor turnover for the benefit of employers.

It is quite natural that we should be upset when we witness the game fish of some of our best fishing waters killed off by waste from an industrial plant, but we must not permit our emotional disturbance to obscure our long range view. This industrial plant has a capital investment in the community, its weekly payroll is distributed through all the channels of trade that contribute to the welfare and prosperity of the community. Probably its managers have given a great deal of thought to the problem of pollution; even the advisability of closing down the plant, which would throw the workers out of employment and have a bad psychological effect on industry and business in general, have been considered as a last expedient by the management. As an alternative that appears inescapable the poisonous waste is permitted to run off into adjacent waters.

Now there should be some scientific approach to this problem. In the case of certain large industrial enterprises it was taken care of in the original plant construction, with the installation of an up-to-date purification system. It may be that a different solution is required for different types of industry, but in any event it is a problem for our chemical engineers and others qualified to make a professional or technical study of the subject.

The Department of Conservation is fully cognizant of the disturbing reactions and repercussions of the pollution problem. With the cooperation of the Louisiana State University we are now installing a laboratory at Baton Rouge, in charge of competent chemical engineers, for the special study of the pollution problem, in the hope that we may arrive at some sound and equitable solution in the best interest of all concerned. We are confronted by a conflict of interests, each with its own special plea; and there is probably not a community in our state that is not vitally affected, with a stake on both sides. Even those communities in which every male is an ardent disciple of Isaac Walton would not care to discourage industry in any form.

This is not a problem that will be solved by the shut-down of a single plant of industry—it calls for constructive planning, the vision of our pioneer conservationists in the light of latter-day industrial development. We welcome the advice and suggestions of all Louisianians in the solution of this problem in the interest of all the people. We only ask that they consider the problem in its broader aspects and not permit the prejudice of an isolated occurrence to obscure the main objective, which is to prevent the contamination of our fishing waters without injury to established industry or any abatement of the material rewards that will surely follow our industrial expansion.

—William G. Rankin.

Petroleum Geologists

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secure a hurried picture of the geographical relationship and aerial distribution of a number of the more accessible Gulf Coast fields, under the guidance of Gulf Coast geologists.

Arrangements have also been made with the Delta Air Line for handling groups of eight or more individuals who wish to make an airplane trip of several hours' duration over the Mississippi Delta.

Use for the Shark

Numbers of fish are obtainable in the waters of the Gulf of potential commercial importance, among these being the sharks and rays, which, at present, are totally neglected. These creatures could be turned into food material for human and animal consumption, besides producing a "liver oil" high in vitamin D, usable as a substitute for cod and halibut liver oil for the prevention of rickets, and at the same time furnish a high grade, serviceable leather from the tanned hides for shoe and hand baggage making.

The Menhaden fish is another resident of Gulf waters which might lend itself to the production of marketable fish oil and by-products.

Nature Guardians

by ESTELLE V. COTTMAN

The opening of schools marks the beginning of a very busy time for the Bureau of Education. It is true that summer has its own pleasant duties, such as lecturing at Boy Scouts', Girl Scouts', Rainbow Girls' and Camp Fire Girls' camps, and staging exhibits at summer fairs and folk schools; but the truly strenuous educational work starts for everyone connected with the Bureau when the bell rings for 9 o'clock on the opening day of school.

To begin with, all the principals and teachers in New Orleans know that at 237 Royal Street there is housed a wonderful display of mounted birds, fish and fur animals, to say nothing of the interesting mineral and forestry exhibits. All these show, in a most illuminating manner, how greatly Louisiana has been blessed by a bountiful Providence with varied and valuable natural resources. Surely, it is only meet and right that our boys and girls—future citizens of the State—should be taught all about them, their economic importance and the necessity for their protection at all times.

For many years the teachers of New Orleans have brought their classes to this Museum of Natural Resources to see the displays, to hear lectures on subjects pertaining to Louisiana's natural wealth and to look at the pictured scenes of vast resources that are spread before their interested young eyes by means of the splendid motion picture facilities of the Bureau. By this medium the often stereotyped lessons of humdrum school hours spring into new life and significance by the vivid presentation of the films.

At the Museum a warm welcome awaits all classes and everything is done to make their visits pleasant as well beneficial. The Bureau of Education earnestly desires all schools of the Parish of Orleans to consider the activities of the Museum of Natural Resources a part of the regular school system and cordially invites teachers and classes to make use of its facilities to the fullest extent.

While the schools of New Orleans enjoy the privilege of spending profitable hours at the Museum, those throughout the State are by no means forgotten. Trained lecturers are sent to each parish to give all Louisiana students the same advantages in the matter of natural history instruction.

These field workers carry a fine collection of mounted and preserved specimens of oysters, fish, crabs, shrimp, minerals, oils, birds, fur animals and forestry products. Whenever it is possible to show motion pictures of the natural resources this is done.

The lecturers are always glad to extend their services to garden clubs, nature clubs and other civic organizations after school is dismissed and at night. Sometimes these talks are given at the local picture house, the school auditorium or in the regular club rooms.

They also take keen interest in the proceedings of the local Nature Guardian Clubs and form new ones wherever the field is promising, believing that the principles of Conservation taught to the Youth of the State in this Club will be a sure foundation for a fine spirit of cooperation in protecting Louisiana's resources when these same boys and girls are men and women.

One of the Bureau's most important duties is the arranging of large exhibits, with competent persons in charge, for the various State fairs each fall. The Conservation Department is always fully represented at the major fairs and every effort is made to have an adequate exhibit at as many minor fairs as is possible. This is a service attracting the admiration and attention of huge crowds of visitors from all over the Southland.

The Bureau of Education is looking forward to a year of fine endeavor and successful projects, and extends the heartiest of good wishes to all the teachers, pupils and Nature Guardians of Louisiana for a happy school year!

LADC Calling ALL Ducks - - -

We invite the attention of discriminating ducks—the Mallard, the Teal, the Pin-tail and their numerous relatives of the waterfowl family—to the incomparable winter resorts of the State of Louisiana.

Over 200,000 acres have been added to the wildlife refuges of this State since last Winter —the protected area for ducks now exceeds that provided by the State of Rhode Island for its land animals, biped and quadruped, so that every visiting duck is assured of first-class board and lodging in a state that is noted for its hospitality.

Beginning the latter part of November there will be some play with firearms, but statistics show that the duck mortality rate from this cause is comparatively low and should be no deterrent to any duck seeking escape from the severe Northern climate into our own balmy Winter. Out of the millions of ducks that visit this state it is not likely that more than one per cent will be bagged by our hunters, many of whom are remarkably poor marksmen. A bad cold, pneumonia and over-eating will account for more than our shot-guns in the casualty list.

Besides the hundreds of thousands of acres set aside as game refuges there are large areas inaccessible to the average hunter—the wary duck has little to fear on the "trembling prairie" which is our marsh-land.

Paradoxically Louisiana is not only the duck hunter's Paradise — the finest hunting ground in all America—it is likewise the duck's Paradise. No other state offers such a sane balance of sport for the hunter and protection for the hunted—a mild climate, a large and bountiful variety of food and a 98.5 per cent chance of escaping the hunter's fire. What more could the most fastidious duck suggest?

In the immortal language of Bienville we say to you, bienvenue—welcome! May your stay be pleasant and your progeny always increase!

DEPARTMENT OF CONSERVATION

126 NEW COURTHOUSE BLDG.,

New Orleans, Louisiana.

LOUISIANA'S NATURAL RESOURCES

Crude oil production is major industry of Louisiana.

Louisiana ranks next to Texas as natural gas producer.

Louisiana now producing timber twice as fast as it is cut.

Louisiana leads in commercial fishing.

Louisiana oyster is world's finest.

Louisiana supplies three-fourths of U. S. muskrat pelts.

PICTURES

TELL THE STORY!

In the panel at the left the artist pictures some of the natural resources of our state—mineral, forestry, fishing and trapping exhibits.

The conservation of these resources so that they will not be dissipated and exhausted—the preservation and replenishment of our wildlife refuges—all impose a responsibility that has been recognized for many years by our constituted authorities.

But we will proceed a step further and so utilize these resources that they will contribute more and more to the material well-being and happiness of our people; through the attraction and encouragement of industry we will greatly enhance the value of these resources by conversion and manufacture, providing employment for the unemployed, at a higher level of wages, so that their per capita buying power may be increased and their standards of living elevated.

In the panel at the right the artist shows us some of the possibilities of industrialization—cheaper fuel for industry from our crude oil and natural gas—lumber for mill-work and house construction, office and home furniture, from our reforestation projects—modern transport and refrigeration facilities that extend the consuming outlets for our fisheries products—the "ultimate consumer" of our trapping industry as reflected in milady's changing style.

We have not yet explored the surface of these possibilities, the utilization of our natural resources and their derivatives to meet the increasing desires and demands of a vast consuming public.

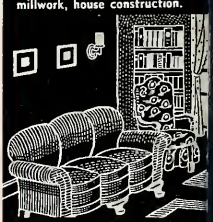
If we value the revenue of these resources at more than $200,000,000 yearly, at their source, it will be possible to double, even treble and quadruple their value by conversion and manufacture, by selling them to the world as finished products, by commandeering the modern forces of salesmanship and advertising to aid our industry.

These natural resources are the most varied of any state in the Union, appealing to the imagination and vision of business men and manufacturers everywhere. Here at the heart of an inland waterway system that provides transportation to the centers of population, here in a climate that permits of outdoor work and play the year 'round; here Nature has given us the foundation of a new industrial empire. It is up to us to finish the job.

WILLIAM G. RANKIN, Commissioner

Cheap fuel for future industry.

Yellow pine and hardwoods for millwork, house construction.



Lumber for interior office and house furniture.

Refrigerator cars and trucks for transportation.

Louisiana seafood preserved for distant consumption.

Milady's fur from Louisiana muskrat, opossum, raccoon, mink, otter—or skunk.

DEPARTMENT OF CONSERVATION, STATE OF LOUISIANA